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# EXACT RELAXATION TIMES AND DYNAMIC FUNCTIONS FOR DILUTE POLYMER SOLUTIONS FROM THE BEAD/SPRING MODEL OF ROUSE AND ZIMM

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13. ABSTRACT

Exact characteristic values $\lambda_1, \lambda_2, \dots, \lambda_N$ are computed for $2 \le N \le 300$ and $0.05 \le h^* \le 0.3$. Functions of $\lambda_p$ associated with steady-and oscillatory-shear flow are tabulated.

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# EXACT RELAXATION TIMES AND DYNAMIC FUNCTIONS FOR DILUTE POLYMER SOLUTIONS FROM THE BEAD/SPRING MODEL OF ROUSE AND ZIMM

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## ABSTRACT

A UNIVAC 1108 Computer has been used to obtain exact values for $\lambda_p$ ($p = 1, 2, \ldots, N$), the non-zero characteristic values of Zimm's matrix HA, for values of $N$ (the number of Gaussian springs per molecule) up to 300; values previously published did not go above $N = 15$ (Thurston and Morrison). For future comparison with elastic and viscous properties of very dilute polymer solutions measured in steady and in oscillatory shear flow, several useful functions of the $\lambda_p$ are computed and tabulated for parameter values in the ranges $2 \leq N \leq 300$, $0.05 \leq h^* \leq 0.3$, where $h^*$ ($= hN^{-1/2}$) is a dimensionless "friction constant"; $h$ denotes the "hydrodynamic interaction parameter" of Zimm. For selected parameter values, certain of the functions are compared graphically with the corresponding functions given by Tschoegl on the basis of approximate calculations using an indefinitely large value for $N$. The present calculations differ from those of Zimm and Tschoegl in only two ways: finite values of $N$ are used (instead of $N = \infty$), and exact values of $\lambda_p$ are computed from an $N \times N$ matrix equation (instead of approximate values from an approximate integro-differential equation). An important new result of the present computation is that, for the particular value $h^* = 0.262$, Flory's intrinsic viscosity function $\Phi$ is substantially independent of $N$ in the range $50 \leq N \leq 300$ and there has the value $2.85 \times 10^{23}$ ml/g; this equals the value given by Zimm's original approximate calculation for the case $N \to \infty$, $h >> 1$. This suggests that the interpretation of intrinsic viscosity data in terms of the well-known 'non-tree-draining' concept should be reconsidered.

1

# EXACT RELAXATION TIMES AND DYNAMIC FUNCTIONS FOR DILUTE POLYMER SOLUTIONS FROM THE BEAD/SPRING MODEL OF ROUSE AND ZIMM*

A. S. Lodge and Yeen-Jing Wu

## 1. Introduction

In the well-known theories of Rouse (1) and Zimm (2) for very dilute solutions of long-chain ('linear polymer') molecules, each polymer molecule is represented by $N$ equal 'thermal motion' 'Gaussian' springs connected end-to-end; the solvent is treated as a constant-temperature environment for the polymer molecules and also as a Newtonian incompressible liquid, of viscosity $\eta_s$, which interacts with each polymer molecule only at $N + 1$ point centers ('beads') situated at the ends of the $N$ springs. Each bead has the same 'friction constant' $f_0$ (which would be equal to $6\pi a\eta_s$ if the bead were a rigid sphere of radius $a$ treated according to Stokes' law). Each spring has the same root-mean-square end-to-end distance $b$ when the solution is not flowing.

Compared with earlier theories (3) in which equal friction constants were assigned to each atom on the 'backbone' of a polymer molecule, the bead/spring theory of Rouse and Zimm involves an extra artificial feature, namely, the concentration of polymer-solvent hydrodynamic interaction at the $N + 1$ fictitious beads. The advantages arising from the simpler mathematics involved, however, are considerable: the dynamic viscosity $\eta'$ and dynamic rigidity $G'$

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as functions of angular frequency $\omega$, for oscillatory small-amplitude shear, have been calculated (1, 2, 4) and compared rather extensively with experimental data (5); more recently, the (macroscopic) constitutive equations, from which all rheological properties in isothermal homogeneous flows can be calculated, have been derived by Lodge and Wu (6), who also list all the assumptions involved in the theory. Precise calculation of the dynamic functions $\eta'(\omega)$, $G'(\omega)$ has recently assumed added importance because improvements in experimental techniques have made possible the extrapolation to zero polymer concentration of the data obtained (7, 8); such 'intrinsic' data can thus properly be compared with the predictions of the bead/spring theory which is based on neglect of interactions between different polymer molecules.

In order to compute the functions $\eta'(\omega)$, $G'(\omega)$, it is necessary to compute the characteristic values $\lambda_p$ $(p = 1, 2, \ldots, N)$ of the symmetric matrix $N \times N$ $B = [B_{pq}]$ whose elements $B_{pq}$ are given by the equations

$$B_{pq} = H_{pq} + H_{p-1,q-1} - H_{p-1,q} - H_{p,q-1} \quad (p, q = 1, 2, \ldots, N), \qquad [1.1]$$

where

$$H_{ij} = \begin{cases} 1 & (i = j) \\ 2^{1/2} h^* |i-j|^{-1/2} & (i \neq j) \end{cases} \quad (i, j = 0, 1, 2, \ldots, N), \qquad [1.2]$$

$$h^* = f_0/[(12\pi^3)^{1/2} \eta_s b] . \qquad [1.3]$$

The matrix B has been introduced by Lodge and Wu (6) as a more convenient alternative to Zimm's singular, non-symmetric, matrix HA which has the characteristic values $0, \lambda_1, \lambda_2, \ldots, \lambda_N$ (6); $H = [H_{ij}]$, and A is defined in equation (11) of Zimm (2).

The object of the present paper is to present the results of computing 'exact' characteristic values $\lambda_1, \lambda_2, \ldots, \lambda_N$ of the matrix B, together with various functions of the $\lambda_p$ of interest for comparison with experimental data obtained in steady- and oscillatory-shear flow. Available computer storage facilities have enabled us to use values of N up to 300, which may well prove to be sufficient for the highest-molecular-weight polymers available. The only other published exact computations (for non-zero $h^*$) are those of Thurston and Morrison (9), whose restriction $N \leq 15$ is rather severe.

We call our values for $\lambda_p$ 'exact' to distinguish between them and the approximate values obtained by Zimm, Roe, and Epstein (10), Hearst (11), and Tschoegl (4) (Table 1), who replaced the discrete eigenvalue problem (associated with matrix equations involving B or HA) by a discrete eigenvalue problem associated with an integro-differential equation (equation (71) of Zimm (2)) regarded as an approximation to the actual matrix equation given by the Zimm model. The approximation involved here has been thought to be reliable when N is large; recently, however, partly as a result of comparing our exact values for $\lambda_p$ with those obtained from the Zimm integro-differential equation, Osaki (12) has noted that Zimm's equation is incorrectly derived from the matrix equation, and that the corrected equation is the following:

$$\alpha(r)(1 - 4h^*) + h \int_{-1}^{1} \alpha''(s) |r - s|^{-1/2} ds = -N^2 \lambda \alpha(r)/4 . \qquad [1.4]$$

Zimm's equation omits the term $-4h^* \alpha(r)$. Zimm's parameter $h$ is given by the equation

$$h = h^* N^{1/2} . \qquad [1.5]$$

In Table 1, the notation $h >> 1$ (used by Zimm) means that, on the left-hand side of [1.4], the integral term alone is retained; as Osaki (12) has observed, this case really corresponds to the value $h^* = 0.25$ (and $N$ large) when the correct approximate equation [1.4] is used.

TABLE 1: Calculations of characteristic values $\lambda_p$ for the bead/spring theory of Rouse and Zimm

| | $N$ | $h$ | $h^*$ | |
|---|---|---|---|---|
| 1. Rouse (1) | 1 to ∞ | 0 | 0 | exact |
| 2. Zimm, Roe, and Epstein (10) | large | >> 1 | | approximate |
| 3. Hearst (11) | large | > 0 | | approximate |
| 4. Tschoegl (4) | large | > 0 | | approximate |
| 5. Thurston and Morrison (9) | 1 to 15 | | 0 to 0.4 | exact |
| 6. Wu (13) | 1 to 222 | | 0.05 to 0.3 | exact |
| 7. Lodge and Wu (this paper) | 2 to 300 | | 0.05 to 0.3 | exact |

In view of the idealization inherent in the bead/spring model and various approximations used in Zimm's analysis of this model (on which our

present calculations and all the calculations of Table 1 are based), it might be argued that the present computations amount to hair splitting; we recognize the weaknesses that remain, but consider that it is worth while making the present computations if only to eliminate any easily avoidable approximations in the analysis of the model and so render it more open to critical examination. Pyun and Fixman (14) have made certain calculations based on the bead/spring model without using one of Zimm's assumptions (namely, that the Oseen hydrodynamic interaction tensor can be replaced by its value averaged in the solution at rest); Wu (13) has compared results of Pyun and Fixman's calculations with the results of the present paper.

The characteristic values $\lambda_p$ are dimensionless functions of the parameters $N$, $h^*$. Certain constants $\tau_p$, called 'relaxation times', defined by the equations

$$\tau_p \lambda_p = (\pi^3/3)^{1/2} \eta_s b^3 h^* /(kT) \quad (p = 1, 2, \ldots, N), \qquad [1.6]$$

where $k$ and $T$ denote Boltzmann's constant and absolute temperature, play a fundamental role in the theory. The present report thus computes exact relaxation times in terms of three parameters, whose values are unknown a priori. The selection of these three parameters may be made in various ways, some of which are listed in Table 2.

TABLE 2. Selections of three basic parameters

| | |
|---|---|
| 1. $N, f_0, b$ | $N$ springs per molecule; $f_0$ = bead friction constant; $b$ = r.m.s. spring length at rest; |
| 2. $N, h^*, b$ | $h^* = f_0/[(12\pi^3)^{1/2}\eta_s b]$; |
| 3. $N, h^*, \tau_1$ | $\tau_1 = f_0 b^2/[6\, kT\lambda_1(N, h^*)]$; |
| 4. $N, h, \tau_1$ | $h = h^* N^{1/2}$; |
| 5. $N, h^*, \tau_0$ | $\tau_0 = \sum_{p=1}^{N} \tau_p$; |
| 6. $m_1, h^*, b$ | $m_1 = M/N$ (M = polymer molecular weight). |

We follow the usual notation according to which $\lambda_1 < \lambda_2 < \cdots < \lambda_N$. $\lambda_1$ is thus the smallest characteristic value, and hence $\tau_1$ is the greatest relaxation time.

2. Computation of $\lambda_1, \lambda_2, \ldots, \lambda_N$.

$\lambda_1, \lambda_2, \ldots, \lambda_N$ are the roots in $\lambda$ of the equation

$$\det(B_{pq} - \lambda\delta_{pq}) = 0. \qquad [3.1]$$

When $h^* = 0$, the roots are given by the equations

$$\lambda_p = 4\sin^2[p\pi/2(N+1)] \quad (p = 1, 2, \ldots, N) \qquad [3.2]$$

given by Rouse (1). When $h^* \neq 0$, the roots for the cases $N = 1, 2$ are as follows:

$$\lambda_1 = 2(1 - 2^{1/2}h^*) \qquad (N = 1) ;$$

$$\lambda_1 = 1 - h^*, \quad \lambda_2 = 3 + (1 - 2^{1/2}4)h^* \qquad (N = 2) . \qquad [3.3]$$

For $h^* \neq 0$ and $N > 3$, we know of no method of obtaining a solution for the $\lambda_p$ in closed form. To obtain solutions by numerical methods, a Fortran program was written in order to compute roots of [3.1] by means of a combination of Householder's method and the 'Q-R method'; the University of Wisconsin-Madison Computing Center's UNIVAC 1108 and 'BUMP 2' Library Subroutine were used; in this way, values of $\lambda_1, \lambda_2, \ldots, \lambda_N$ were obtained for various values of $h^*$ and for values of $N$ up to 222 (13); computer storage limitations made it impossible to handle higher values of $N$ using this program. Subsequently, use was made of the fact that B is symmetric, and a modified Miami University Program (H. J. Wertz version, dated 4/5/68) for handling packed matrices enabled the computations to be extended up to values of $N = 300$. To compute a complete set of characteristic values for a given value of $N$ and a given value of $h^*$, the following times were required:

| | | | | | |
|---|---|---|---|---|---|
| N: | 25 | 50 | 100 | 200 | 300 |
| Time in seconds: | 0.3 | 1.6 | 10 | 70 | 235 . |

These times do not vary much with $h^*$.

Table 3 contains the results of computing various functions of the $\lambda_p$. The values of $\lambda_1$ and $\lambda_N$ are tabulated. Values of $\lambda_2, \lambda_3, \ldots, \lambda_{N-1}$ have not been tabulated here, but are available on request to one of the authors (A. S. L.); some have been tabulated by Wu (13).

The following checks on the computation confirm the reliability of the results and indicate that the computational error in Table 3 entries should nowhere exceed unity in the fourth significant figure:

1. Values obtained for $\lambda_p$ are consistent with the equation

$$\sum_{p=1}^{N} \lambda_p = \text{Trace B}; \qquad [3.\,]$$

2. For $N = 1, 2, \ldots, 15$, and various values of $h^*$, the values obtained for $\lambda_p$ agree with those computed by Thurston and Morrison (9);

3. For $N = 1, 2$, values of $\lambda_p$ are consistent with [3.3];

4. For $N = 50, 100, 200$ and $h^* = 0.1, 0.2, 0.3$, most of the tabulated functions were computed using both programs referred to above; comparison of entries showed agreement to three significant figures and, in most cases examined, to four significant figures; a few entries showed differences of unity in the fourth significant figure.

A minor advantage in using $h^*$, rather than $h$, as a parameter in the tabulation is that $h^*$ has an upper limit, while $h$ does not (assuming that $N$ could be indefinitely great). We have chosen values of $h^*$ in the interval $0.05 \leq h^* \leq 0.3$. Thurston and Morrison (9) quote the value 0.471 for the upper bound of $h^*$, but do not give details of their derivation; in an attempt to follow their argument, we obtain the value 0.65. Alternatively, using the very crude argument that $f_0 = 6\pi a\eta_s$ for a rigid spherical bead of radius $a$, the inequality $2a < b$ yields the result $h^* < 0.49$. Because of

the artificiality inherent in the model, we do not place much weight on the actual value of the upper bound on $h^*$ given by such arguments; it seems reasonable, however, to suppose that there is an upper bound. Independent arguments based on a comparison of the results of the present calculations with measured data on intrinsic viscosity of polymer solutions suggest that the useful range for $h^*$ is $0 < h^* \leq 0.26$. This range is fairly well covered by the entries in Table 3. Thurston and Morrison (9) have noted that the condition $h^* < 0.65$ is sufficient to ensure that $\lambda_p$ shall be positive for $N = 1, 2$ (cf. [3.3]).

3. Steady shear flow functions

In the usual notation, we express the intrinsic viscosity $[\eta]$ in the form

$$[\eta] := \lim_{c \to 0} \frac{\eta - \eta_s}{c\eta_s} = \Phi \langle r^2 \rangle^{3/2} M^{-1} \qquad [3.1]^{**}$$

where $c$ is the polymer concentration in g/ml, $\eta$ is the solution viscosity, and $\langle r^2 \rangle$ is the mean square end-to-end distance of a polymer molecule in the solution at rest. This equation may be regarded as a definition of the quantity $\Phi$. The bead/spring theory gives the following equation for $\Phi = \Phi(N, h^*)$:

$$\Phi = (\pi^3/3)^{1/2} N_a h^* N^{-3/2} \sum_{p=1}^{N} \lambda_p^{-1}, \qquad [3.2]$$

where $N_a = 6.0228 \times 10^{23}$ (Avogadro's number).

---

** The notation $A := B$ means "$A$ is defined by the equation $A = B$".

In Table 3, values of $\Phi$ are tabulated for various values of $N$ and $h^*$. For comparison with the approximate values calculated by Tschoegl for $N = \infty$, the values of $\Phi$ have been plotted as functions of $\log h$ in Figure 1. It is seen that the experimentally-interesting range of values for $\Phi$, namely $2.5 \leq 10^{-23}\Phi \leq 2.9$, are obtained with values of $N$ in the range $25 \leq N \leq 300$ and values of $h^*$ near $0.25$, when the exact characteristic values are used, and with large values of $h$ when the approximate characteristic values (with $N = \infty$) are used. In particular, for the special value $h^* = 0.262$, Table 3 gives the following values for $\Phi$ (in g/ml):

$$
\begin{array}{lcccccc}
N: & 8 & 25 & 50 & 100 & 200 & 300 \\
10^{-23}\Phi: & 2.954 & 2.864 & 2.853 & 2.852 & 2.855 & 2.856 \quad (h^* = 0.262)
\end{array}
\qquad [3.3]
$$

For $25 \leq N \leq 300$, it is seen that $\Phi(N, h^*)$ (with $h^* = 0.262$) is substantially independent of $N$ and that its value is close to the value $2.84 \times 10^{23}$ obtained by Zimm (2) from the approximate calculation based on the values $N = \infty$, $h \gg 1$.

The case $h \gg 1$ is described by Zimm (2) as the "non-free-draining case", presumably because a large value of $h$ is associated with a predominating bead-bead hydrodynamic interaction term in the equations of motion for a bead/spring unit and this in turn is believed to imply that, within a surface enveloping the polymer molecule, there is a substantial region of solvent which is 'immobilized' by the polymer molecule in the sense that the solvent velocity

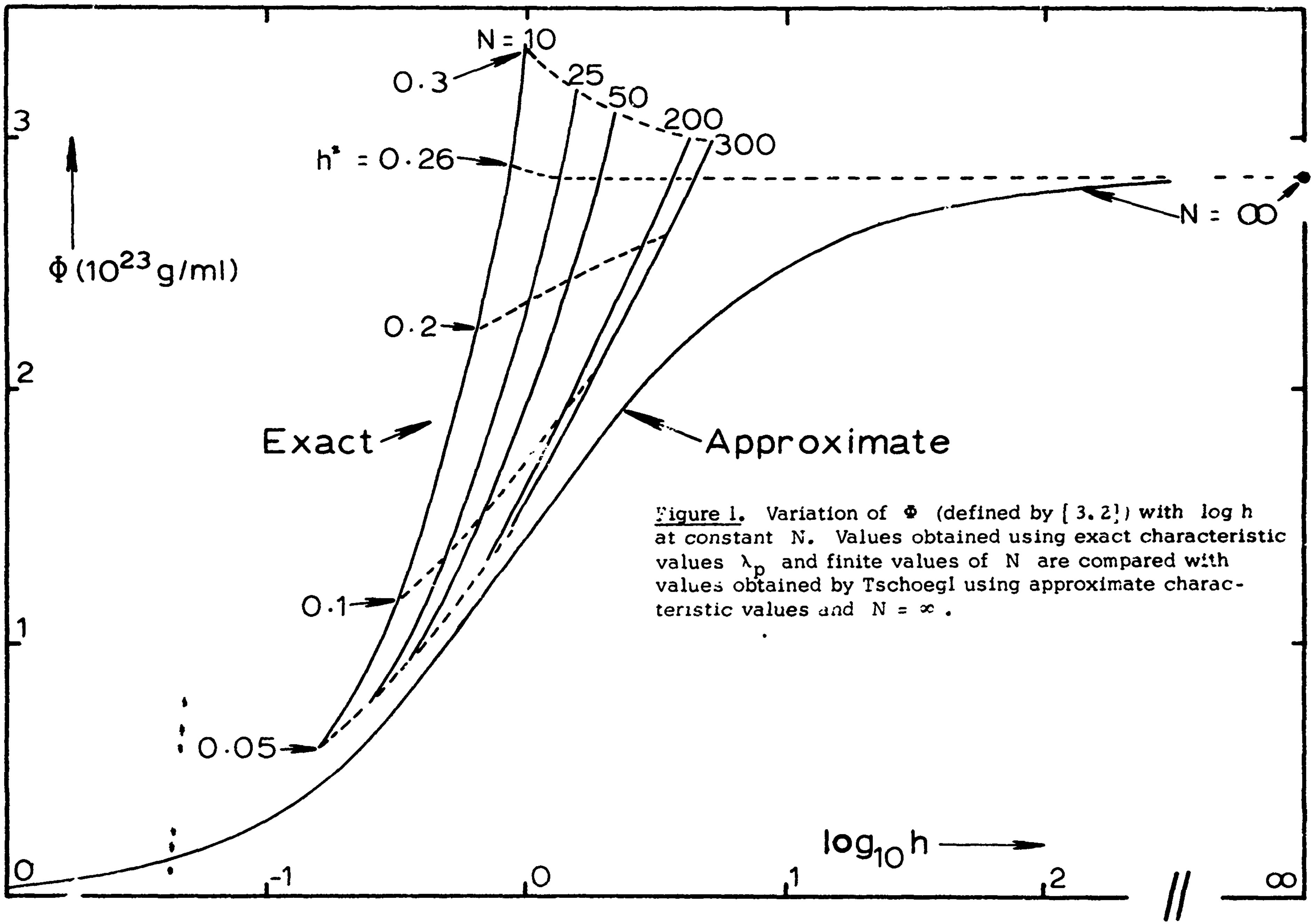



Figure 1. Variation of $\Phi$ (defined by [3.2]) with log h at constant N. Values obtained using exact characteristic values $\lambda_p$ and finite values of N are compared with values obtained by Tschoegl using approximate characteristic values and $N = \infty$.

equals some average polymer molecule velocity. Whether or not this concept could be substantiated for the case $h >> 1$ by calculation of solvent and polymer velocities using the equations of the Zimm theory, our present results suggest that the concept of the non-free-draining limit may not in fact be appropriate for dilute solutions of linear polymers for which $\Phi$ has a value near $2.85 \times 10^{23}$ g/ml: using our exact characteristic values, such a value is obtained when $h^* = 0.262$, and there seems to be no a priori reason for thinking that this value of the dimensionless friction constant is so large that partial or complete 'solvent immobilization' should occur.

In Figure 2, the data are replotted to show the variation of log $\Phi$ with $h^*$ at constant $N$; the fact that the curves for $N \geq 25$ pass approximately through a common point (whose abscissa is 0.262) reflects the results [3.3].

For comparison of the theory with the experimentally determined molecular weight dependence of the intrinsic viscosity, Thurston and Morrison (9) make the reasonable assumption that $N$ is proportional to $M$. For limited ranges of $M$ values, both $[\eta]$ and $\langle r^2 \rangle$ (determined from light-scattering data) vary approximately as powers of $M$. In this connection, it is of interest to note that, according to our calculations, $\Phi$ can be represented approximately by an equation of the form

$$\Phi(N, h^*) = a_1(h^*)N^{n_1(h^*)} \qquad [3.4]$$

for limited ranges of values of $N$; the dependence of the index $n_1$ on $h^*$ is shown in Figure 3: the fact that two curves are given for different ranges of

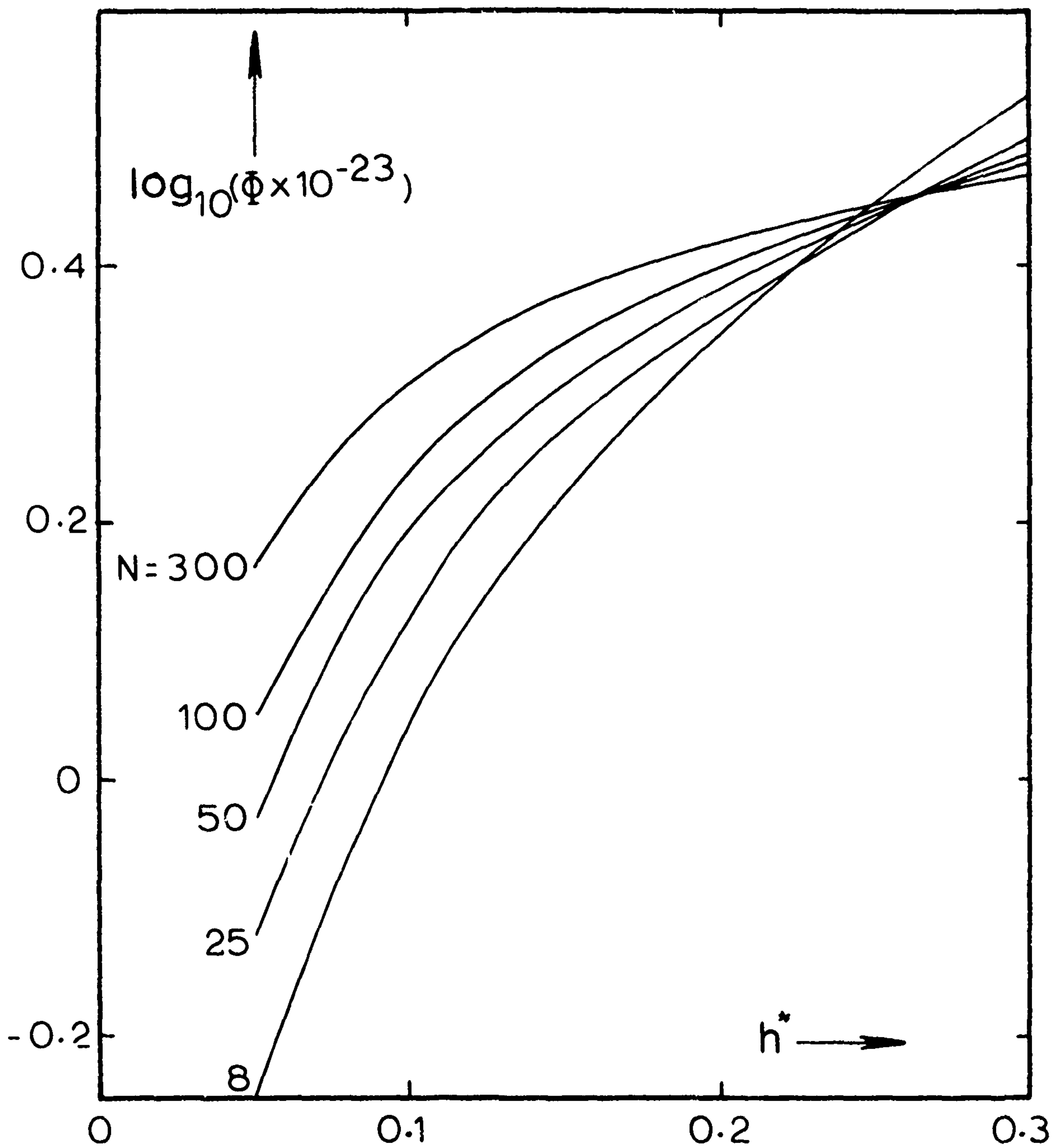



Figure 2. Variation of log $\Phi$ with $h^*$ at constant N calculated from [3.2] using exact characteristic values $\lambda_p$.

N reflects the fact that [3.4] is only an approximate representation of the dependence of $\Phi$ on N. Again, the fact that $n_1 = 0$ when $h^* = 0.262$ is a reflection of [3.3].

In Figures 4, 5, the quantities

$$\tau_0/\tau_1 \sum_{p=1}^{N} \tau_p/\tau_1 = \sum_{p=1}^{N} \lambda_1/\lambda_p, \qquad [3.4]$$

$$J_{eR} = \frac{\sum_{p=1}^{N} \tau_p^2}{\left(\sum_{p=1}^{N} \tau_p\right)^2} = \frac{\sum_{p=1}^{N} \lambda_p^{-2}}{\left(\sum_{p=1}^{N} \lambda_p^{-1}\right)^2}, \qquad [3.6]$$

are represented as functions of log h at constant values of N, and are compared with the corresponding quantities evaluated by Tschoegl (for $N \to \infty$) using approximate characteristic values.

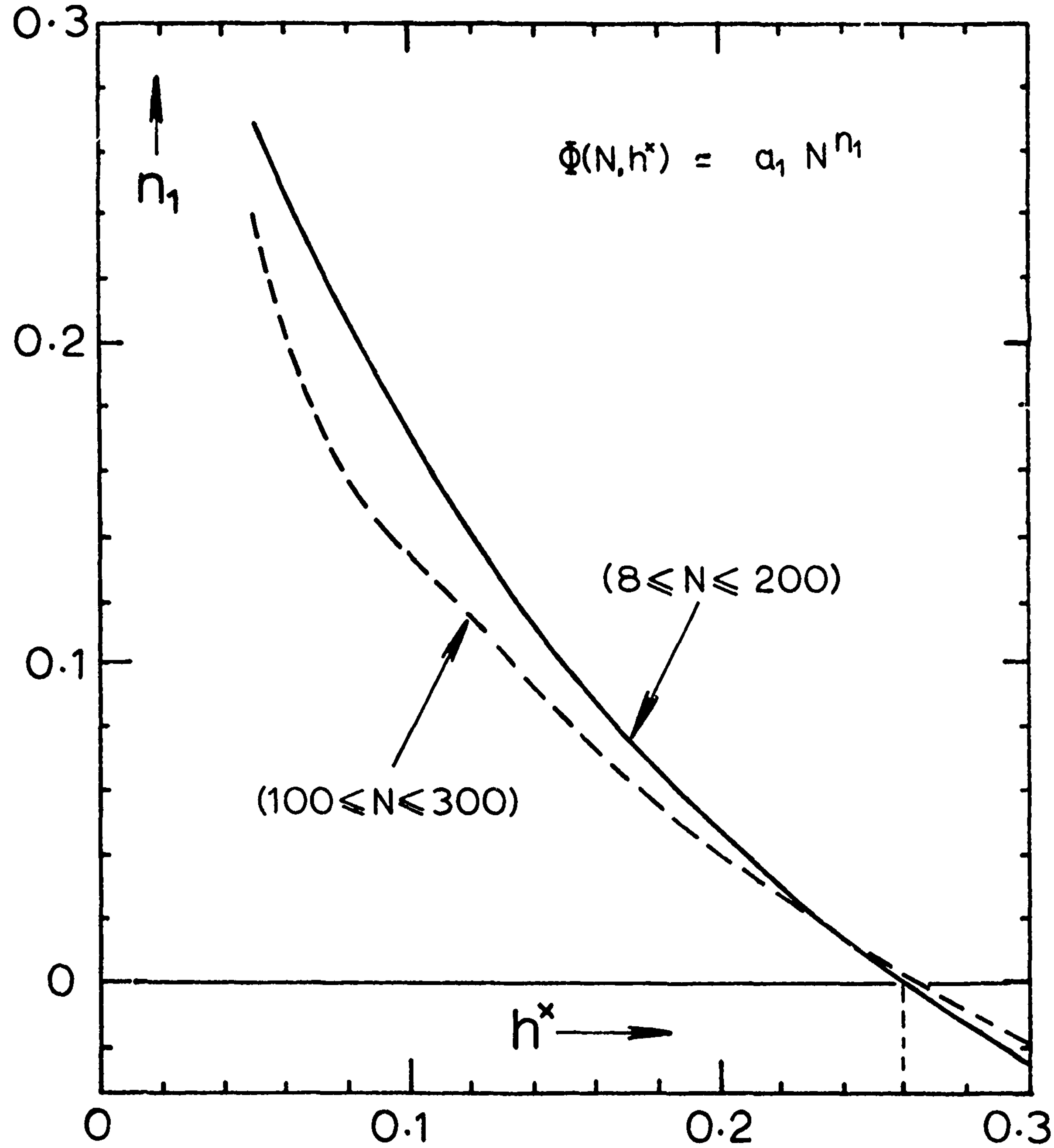
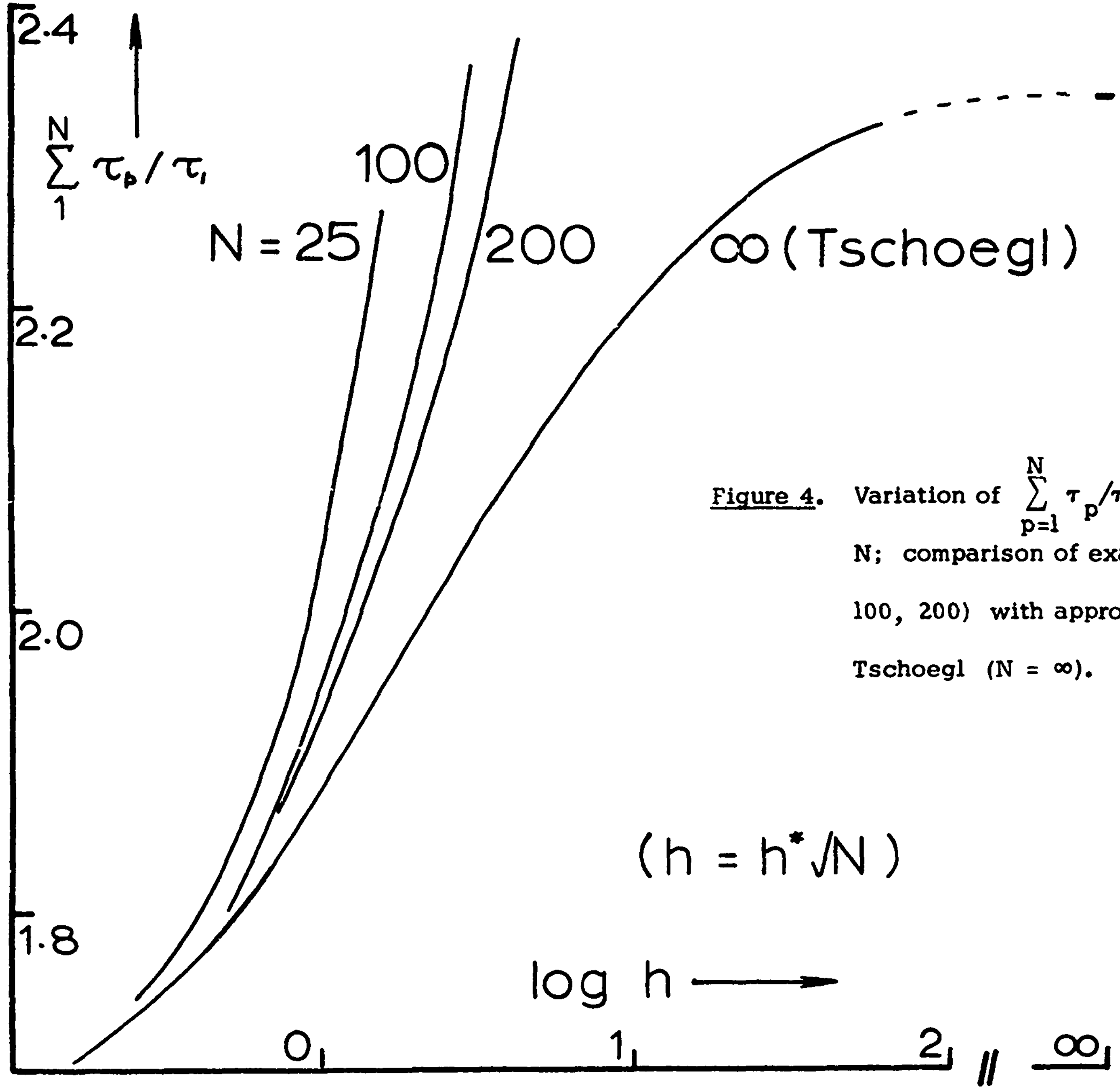



Figure 3. Dependence of index $n_1$ on $h^*$, where $\Phi(N, h^*)$, calculated from [3.2] using exact characteristic values $\lambda_p$, is represented approximately by [3.4].




<u>Figure 4</u>. Variation of $\sum_{p=1}^{N} \tau_p/\tau_1$ with log h at constant N; comparison of exact calculations (N = 25, 100, 200) with approximate calculations of Tschoegl (N = ∞).

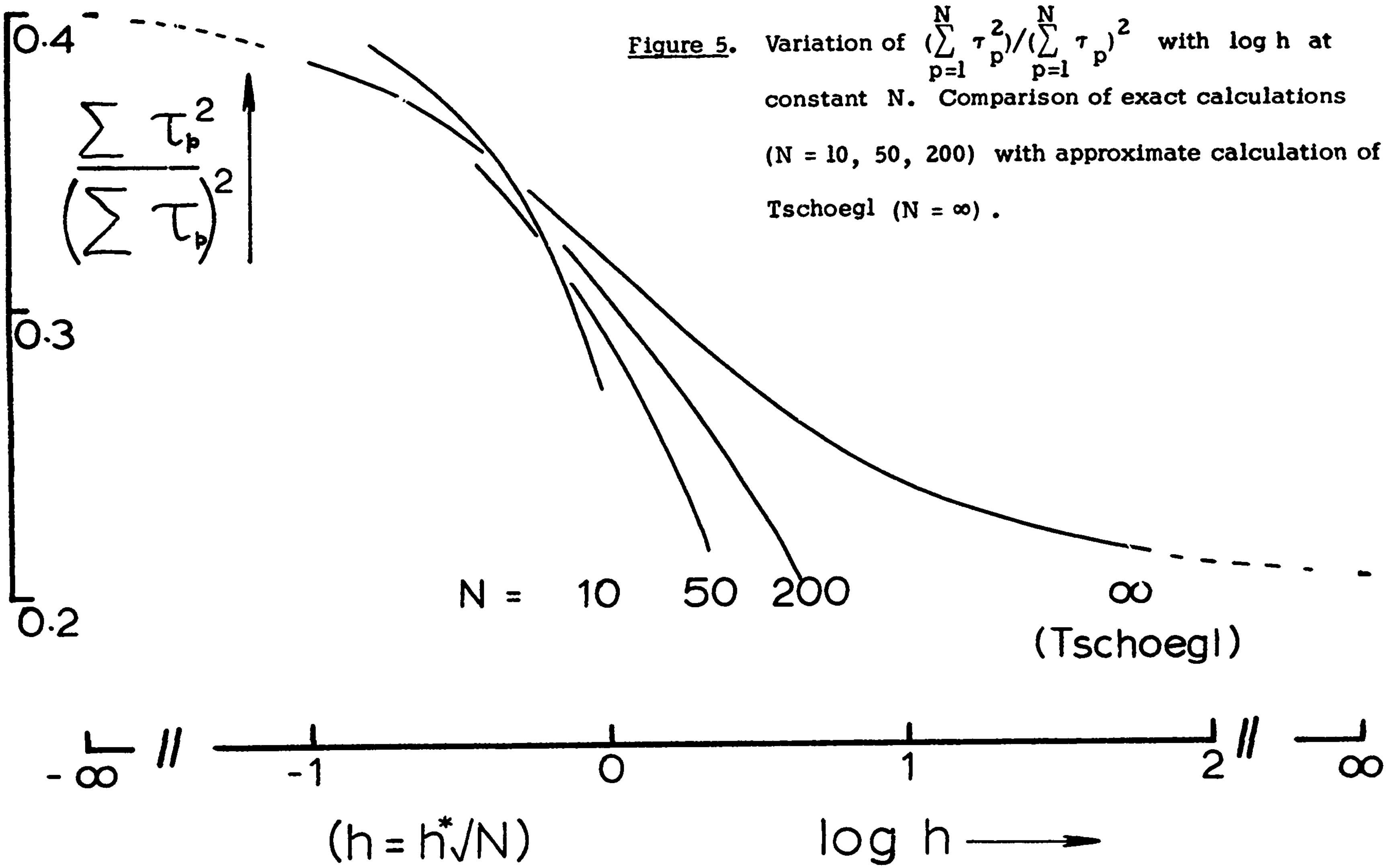



**Figure 5.** Variation of $(\sum_{p=1}^{N} \tau_p^2)/(\sum_{p=1}^{N} \tau_p)^2$ with log h at constant N. Comparison of exact calculations (N = 10, 50, 200) with approximate calculation of Tschoegl (N = ∞).

## 4. Small-strain oscillatory shear

According to the bead/spring theory (2), the dynamic viscosity $\eta'$ and dynamic rigidity $G'$ in a state of steady sinusoidal oscillatory shear of small strain amplitude satisfy the equations

$$\lim_{c\to 0} \frac{\eta'-\eta_s}{c} = \frac{RT}{M} \tau_1 \eta_R'(N, h^*, \omega\tau_1) , \qquad [4.1]$$

$$\lim_{c\to 0} \frac{G'}{c\omega} = \frac{RT}{M} \tau_1 \eta_R''(N, h^*, \omega\tau_1), \qquad [4.2]$$

where $R = kN_a$,

$$\eta_R' := \sum_{p=1}^{N} \frac{\lambda_1}{\lambda_p} \left\{1 + \left(\omega\tau_1 \frac{\lambda_1}{\lambda_p}\right)^2\right\}^{-1} , \qquad [4.3]$$

$$\eta_R'' := \omega\tau_1 \sum_{p=1}^{N} \left(\frac{\lambda_1}{\lambda_p}\right)^2 \left\{1 + \left(\omega\tau_1 \frac{\lambda_1}{\lambda_p}\right)^2\right\}^{-1} , \qquad [4.4]$$

and $\omega$ denotes the angular frequency. The greatest relaxation time $\tau_1$, according to [1.6], is given by the equation

$$\tau_1 = \tau_1(N, h^*, b) = \left(\frac{\pi^3}{3}\right)^{1/2} \frac{\eta_s}{kT} \frac{b^3 h^*}{\lambda_1(N, h^*)} , \qquad [4.5]$$

and is thus a function of the three parameters $N$, $h^*$, $b$.

Using the exact characteristic values, the functions $\eta_R'(N, h^*, \omega\tau_1)$ and $\eta_R''(N, h^*, \omega\tau_1)$ have been computed for values of $N$, $h^*$, and $\log_{10}\omega\tau_1$ in ranges of practical interest. The results, together with values of related functions of interest, are given in Table 3.

In figures 6-9, $\log \eta_R'$ and $\log \eta_R''$ are plotted as functions of $\log \omega\tau_0$, where $\tau_0$ is defined by the equation

$$\tau_0 := \sum_{p=1}^{N} \tau_p \, . \qquad [4.6]$$

$\tau_0$ is a convenient dimensionless variable to choose for the abscissa when comparing dynamic functions $\eta'_R$ and $\eta''_R$ obtained using different values of parameters $N$, $h^*$ and different methods of calculation (exact and approximate): from [4.1], [4.3] and the fact that $\eta = \eta'$ when $\omega = 0$, it follows that

$$[\eta] = \frac{RT}{M\eta_s} \tau_0 \, . \qquad [4.7]$$

Comparison of curves using the abscissa $\log \omega\tau_0$ thus amounts to comparison at constant $[\eta]$.

From Figure 6, it is seen that there is a small but significant difference between the exact and the approximate curves when $h = 2$; the differences at the largest values of $\log \omega\tau_0$ doubtless reflect the difference in values of $N$ $(100, \infty)$ used in the comparison (see also Figure 7); the difference in curves at lower frequencies is attributed to errors arising in the approximate calculation (based on the use of [1.4] without the term $- 4h^* \alpha(r)$) .

From Figure 7, it is seen that, when $h^* = 0.3$, a change in the value of $N$ from 50 to 200 leaves the low-frequency behavior substantially unaltered but moves the point of intersection of the $\eta'_R$-curve and the $\eta''_R$-curve to higher frequencies.

Figures 8 and 9 compare the Zimm curves $(N = \infty, h >> 1)$ with the exact curves for high $(h^* = 0.3)$ and low $(h^* = 0.1)$ values of the friction constant.

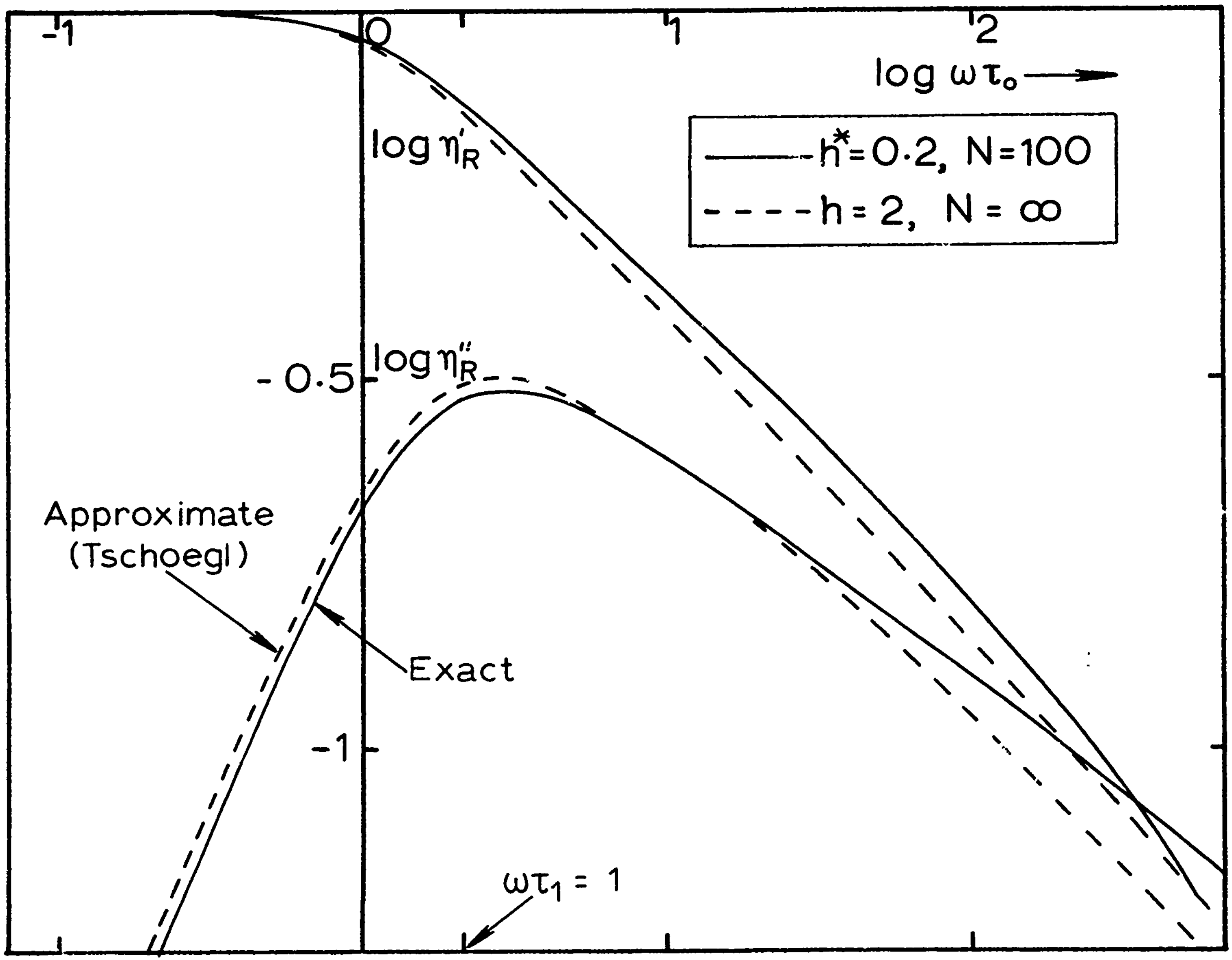
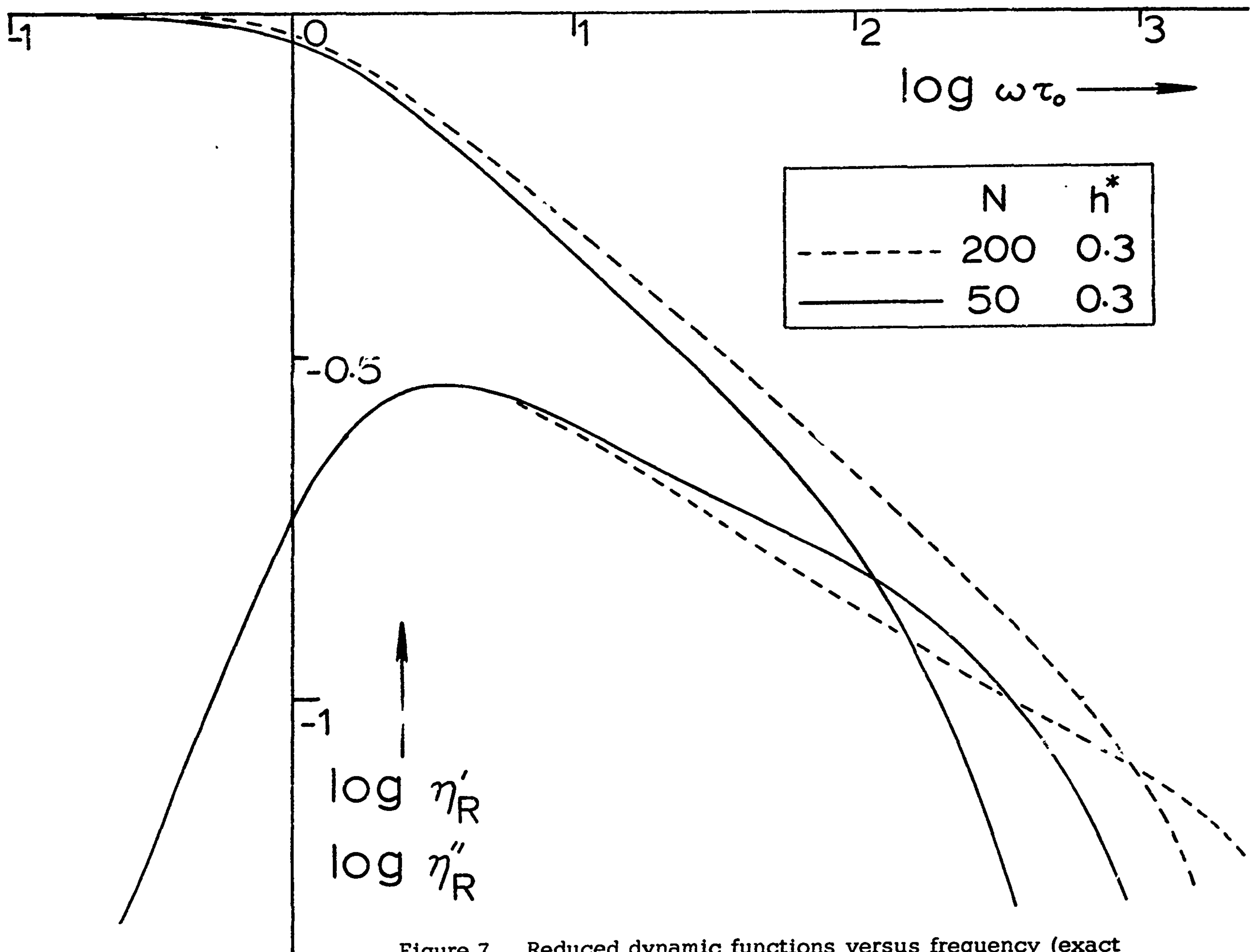



Figure 6. Reduced dynamic functions versus frequency. Comparison of exact calculation ($N = 100$) with approximate calculation ($N = \infty$) of Tschoegl for the case $h = 2$.




<u>Figure 7</u>. Reduced dynamic functions versus frequency (exact calculations). Comparison of $N = 50$ and $N = 200$ for the case $h^* = 0.3$.

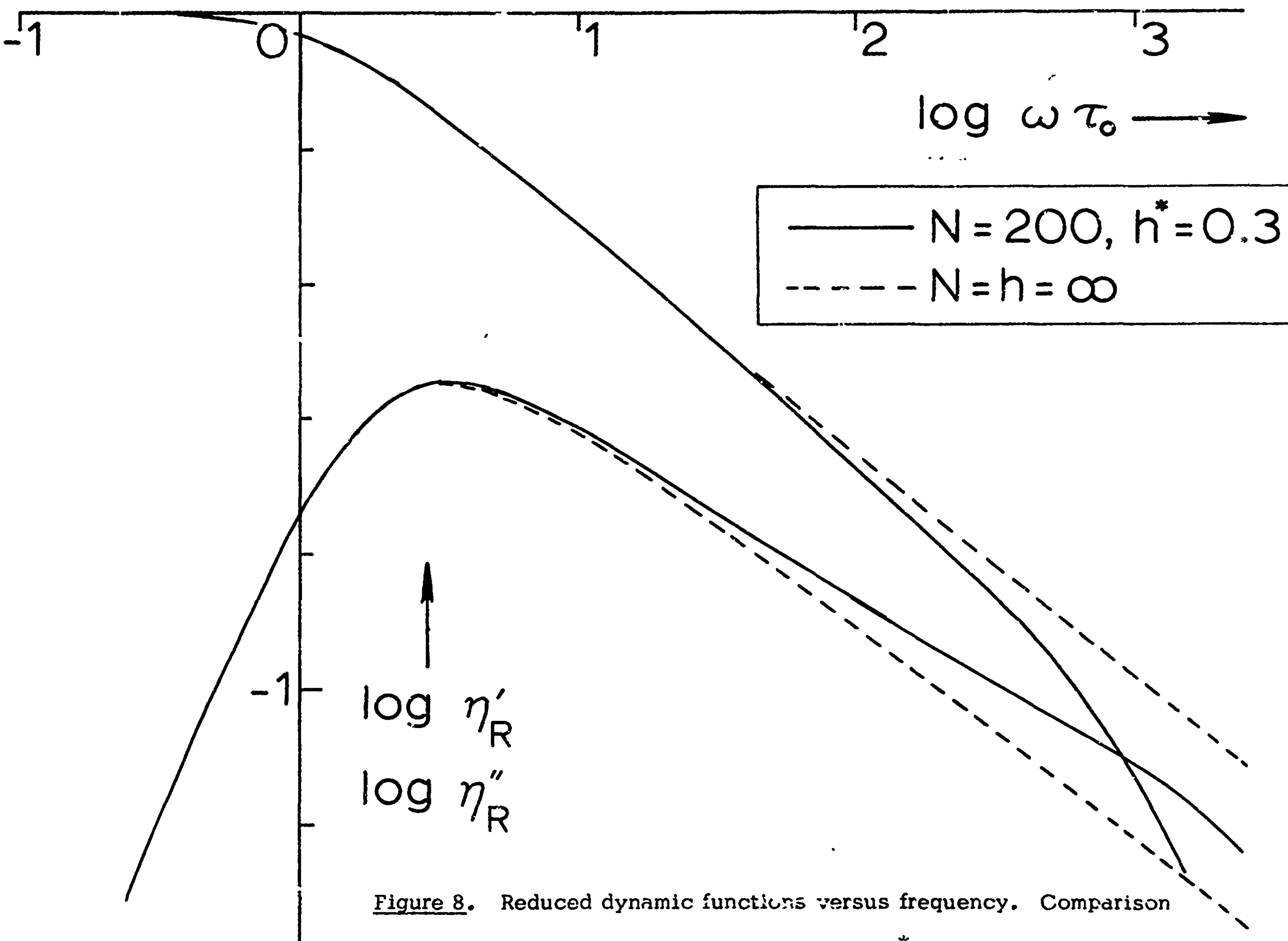
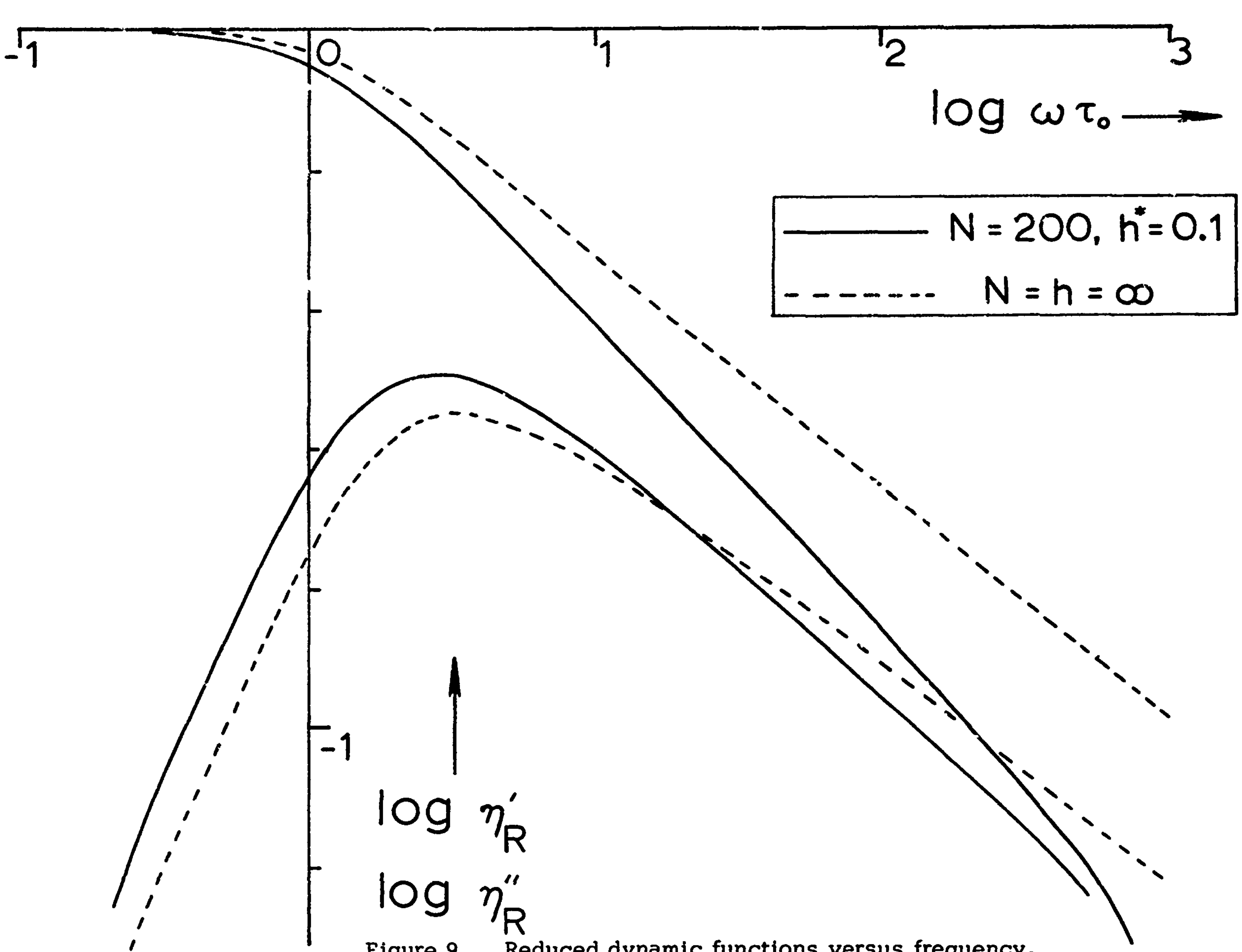



Figure 8. Reduced dynamic functions versus frequency. Comparison of exact calculations ($N = 200$, $h^* = 0.3$) with approximate calculations ($N = \infty$, $h >> 1$) of Zimm.




<u>Figure 9</u>. Reduced dynamic functions versus frequency. Comparison of exact calculations ($N = 200$, $h^* = 0.1$) with approximate calculations ($N = \infty$, $h >> 1$) of Zimm.

It is intended, in a future publication, to present results of a comparison of the present calculations with experimental data giving the variation of $[\eta]$ with $M$ and of $\eta'$ and $G'$ with $\omega$.

5. Discussion

The present calculations are simply an extension of the calculations of Thurston and Morrison (9) to values of $N$ up to 300. In comparison with the earlier calculations of Zimm and Tschoegl, the importance of our calculations and those of Thurston and Morrison is twofold: (i) our calculations are exact (within the confines of the Zimm treatment of the bead/spring model); and (ii) $N$, the number of springs per polymer molecule, appears as an additional parameter whose value is at our disposal when we wish to compare theoretical predictions with experimental data on any given solution of linear polymer molecules of equal molecular weight.

It is possible that (ii) is more important, and more open to question, than (i). Thurston and Morrison (9) have already made use of (ii) in offering a possible interpretation of the dependence of $[\eta]$ on $M$, using the assumption that $N$ is proportional to $M$ for a given polymer/solvent system. Thurston and Schrag (15) have similarly interpreted their experimental data on oscillatory flow birefringence; for values of $M$ down to $10^3$, they use values of $N$ down to 1 for the polystyrene/Aroclors system.

We do not propose here to embark on a comprehensive discussion of the issues raised by the use of $N$ as a parameter, but we do recognize that

this use is open to the criticism that N is too closely connected with the main artificial feature of the bead/spring model (namely, the arbitrary concentration of hydrodynamic interaction at discrete points on the Gaussian spring system) to provide a meaningful parameter having significance for any actual polymer solution. Awareness of this criticism no doubt influenced the early applications of the bead/spring theory (1, 2, 4, 5) in which the equations were cast in a form in which N did not appear: this was achieved partly taking $N = \infty$ in the upper limits of sums in equations such as [3.2], [3.4], and [3.6] and partly by the use of the integro-differential eigenvalue equation for the case of very large N. On the other hand, the use of very large values of N is itself open to criticism: for a given polymer molecule, a certain minimum number (perhaps not well-defined, but nonetheless real) of backbone bonds are required in order that the corresponding part of the molecule may be approximately treated as a Gaussian spring; furthermore, the fact that N may not appear in an equation does not, by itself, eliminate the dependence of the equation on the artificial feature of the model.

We are perhaps on safer ground if we confine applications of the bead/spring theory to properties for which the results predicted by the theory are insensitive to the value of N; an example is furnished by the low-frequency behavior of the dynamic functions shown in Figure 7. On the other hand, it is just conceivable that a more fundamental treatment of polymer/solvent dynamics than that represented by the bead/spring idealization could furnish criteria for the validity of the bead/spring idealization (with finite N)

as an approximation. We hope that the calculation of the present report, when compared critically with suitable experimental data, might lead to a better understanding of the justification for and limitations of the bead/spring model.

## Acknowledgments

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Table 3: Exact characteristic values and steady-and oscillatory-shear-flow functions

Key to entries

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| $\lambda_1$ | $\lambda_N$ | $\lambda_N^{-1}$ | $\sum_1^N \lambda_p^{-1}$ | $\sum_1^N \frac{\lambda_1}{\lambda_p}$ | $(\sum_1^N \frac{\lambda_1}{\lambda_p})^{-1}$ | $\sum_1^N \frac{1}{\lambda_p^2}$ | $\sum_1^N (\frac{\lambda_1}{\lambda_p})^2$ | $J_{eR}$ | $\Phi \times 10^{-23}$ g/ml |
| [3.1] | | | | | | | | [3.6] | [3.2] |

| LOG | OMT1 | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 | H* |
|---|---|---|---|---|---|---|---|---|
| $\log_{10}$ | $\omega\tau_1$ | $\eta'_R$ | $\eta''_R$ | $G'_R$ | $G''_R$ | $\lvert\eta'_R + i\eta''_R\rvert$ | $\tan^{-1}\frac{\eta''_R}{\eta'_R}$ | $h^*$ |
| | | [4.3] | [4.4] | $\omega\tau_1\eta''_R$ | $\omega\tau_1\eta'_R$ | | | |

Exponential notation: .769-03 means $0.769 \times 10^{-3}$.

Parameter values

| $h^*$ / N | 0.05 | 0.075 | 0.1 | 0.13 | 0.15 | 0.2 | 0.25 | 0.262 | 0.3 |
|---|---|---|---|---|---|---|---|---|---|
| 2 | | X | | X | X | | X | | |
| 4 | | X | X | X | X | X | X | | |
| 8 | | X | X | X | X | X | X | X | |
| 25 | X | X | X | X | X | X | X | X | X |
| 50 | X | X | X | X | X | X | X | X | X |
| 100 | X | X | X | X | X | X | X | X | X |
| 200 | X | X | X | X | X | X | X | X | X |
| 300 | X | X | X | X | X | X | X | X | X |

EXACT ZIMM EIGENVALUES N= 2 H*= .075

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JFR | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .925+00 | .265+01 | .377+00 | .145+01 | 1.349 | .741 | .131+01 | 1.1218 | .616 | .749 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .130 | -2.750 | -5.550 | -2.670 | .135+01 | .178-02 | .282-05 | .214-02 | .135+01 | .132-02 |
| -2.0 | .130 | -1.950 | -3.950 | -1.870 | .135+01 | .112-01 | .112-03 | .135-01 | .135+01 | .832-02 |
| -1.8 | .130 | -1.750 | -3.550 | -1.670 | .135+01 | .178-01 | .282-03 | .214-01 | .135+01 | .132-01 |
| -1.4 | .129 | -1.351 | -2.751 | -1.271 | .135+01 | .446-01 | .178-02 | .536-01 | .135+01 | .331-01 |
| -1.0 | .127 | -.954 | -1.954 | -.873 | .134+01 | .111+00 | .111-01 | .134+00 | .134+01 | .829-01 |
| -.8 | .122 | -.760 | -1.560 | -.678 | .132+01 | .174+00 | .276-01 | .210+00 | .133+01 | .131+00 |
| -.6 | .110 | -.574 | -1.174 | -.490 | .129+01 | .267+00 | .670-01 | .323+00 | .131+01 | .204+00 |
| -.4 | .031 | -.408 | -.808 | -.319 | .121+01 | .391+00 | .156+00 | .480+00 | .127+01 | .314+00 |
| -.2 | .020 | -.280 | -.480 | -.180 | .105+01 | .525+00 | .331+00 | .661+00 | .117+01 | .464+00 |
| .0 | -.091 | -.216 | -.216 | -.091 | .811+00 | .609+00 | .609+00 | .811+00 | .101+01 | .644+00 |
| .2 | -.258 | -.223 | -.023 | -.058 | .552+00 | .599+00 | .949+00 | .875+00 | .815+00 | .826+00 |
| .4 | -.476 | -.287 | .113 | -.076 | .334+00 | .517+00 | .130+01 | .839+00 | .615+00 | .997+00 |
| .6 | -.748 | -.396 | .204 | -.148 | .178+00 | .402+00 | .160+01 | .710+00 | .440+00 | .115+01 |
| .8 | -1.075 | -.544 | .256 | -.275 | .842-01 | .296+00 | .180+01 | .531+00 | .298+00 | .128+01 |
| 1.0 | -1.439 | -.718 | .282 | -.439 | .364-01 | .191+00 | .191+01 | .364+00 | .195+00 | .138+01 |
| 1.2 | -1.824 | -.907 | .293 | -.624 | .150-01 | .124+00 | .196+01 | .238+00 | .125+00 | .145+01 |
| 1.4 | -2.217 | -1.102 | .298 | -.817 | .607-02 | .790-01 | .199+01 | .152+00 | .793-01 | .149+01 |
| 1.6 | -2.615 | -1.300 | .300 | -1.015 | .243-02 | .501-01 | .193+01 | .967-01 | .502-01 | .152+01 |
| 1.8 | -3.013 | -1.499 | .301 | -1.213 | .969-03 | .317-01 | .200+01 | .612-01 | .317-01 | .154+01 |
| 2.0 | -3.413 | -1.699 | .301 | -1.413 | .386-03 | .200-01 | .200+01 | .386-01 | .200-01 | .155+01 |
| 2.2 | -3.813 | -1.899 | .301 | -1.613 | .154-03 | .126-01 | .200+01 | .244-01 | .126-01 | .156+01 |
| 2.4 | -4.213 | -2.099 | .301 | -1.813 | .613-04 | .796-02 | .200+01 | .154-01 | .796-02 | .156+01 |
| 2.6 | -4.613 | -2.299 | .301 | -2.013 | .244-04 | .502-02 | .200+01 | .971-02 | .502-02 | .157+01 |
| 2.8 | -5.013 | -2.499 | .301 | -2.213 | .971-05 | .317-02 | .200+01 | .613-02 | .317-02 | .157+01 |
| 3.0 | -5.413 | -2.699 | .301 | -2.413 | .387-05 | .200-02 | .200+01 | .387-02 | .200-02 | .157+01 |
| 3.4 | -6.213 | -3.099 | .301 | -2.813 | .613-06 | .796-03 | .200+01 | .154-02 | .796-03 | .157+01 |
| 3.8 | -7.013 | -3.499 | .301 | -3.213 | .971-07 | .317-03 | .200+01 | .613-03 | .317-03 | .157+01 |
| 4.2 | -7.813 | -3.899 | .301 | -3.613 | .154-07 | .126-03 | .200+01 | .244-03 | .126-03 | .157+01 |
| 4.6 | -8.613 | -4.299 | .301 | -4.013 | .244-08 | .502-04 | .200+01 | .971-04 | .502-04 | .157+01 |
| 5.0 | -9.413 | -4.699 | .301 | -4.413 | .387-09 | .200-04 | .200+01 | .387-04 | .200-04 | .157+01 |

EXACT ZIMM EIGENVALUES N= 2 H*= .130

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .870+00 | .239+01 | .418+00 | .157+01 | 1.363 | .734 | .150+01 | 1.1320 | .609 | 1.395 |

PEDUCED CYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2P | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .135 | -2.746 | -5.546 | -2.665 | .136+01 | .179-02 | .284-05 | .216-02 | .136+01 | .132-02 |
| -2.0 | .135 | -1.946 | -3.946 | -1.865 | .136+01 | .113-01 | .113-03 | .136-01 | .136+01 | .830-02 |
| -1.8 | .135 | -1.746 | -3.546 | -1.665 | .136+01 | .179-01 | .284-03 | .216-01 | .136+01 | .132-01 |
| -1.4 | .134 | -1.347 | -2.747 | -1.266 | .136+01 | .450-01 | .179-02 | .542-01 | .136+01 | .330-01 |
| -1.0 | .131 | -.950 | -1.950 | -.869 | .135+01 | .112+00 | .112-01 | .135+00 | .136+01 | .827-01 |
| -.8 | .126 | -.756 | -1.556 | -.674 | .134+01 | .175+00 | .278-01 | .212+00 | .135+01 | .130+00 |
| -.6 | .114 | -.570 | -1.170 | -.486 | .130+01 | .269+00 | .676-01 | .327+00 | .133+01 | .204+00 |
| -.4 | .086 | -.403 | -.803 | -.314 | .122+01 | .395+00 | .157+00 | .485+00 | .128+01 | .313+00 |
| -.2 | .025 | -.275 | -.475 | -.175 | .106+01 | .530+00 | .335+00 | .669+00 | .119+01 | .464+00 |
| .0 | -.086 | -.210 | -.210 | -.086 | .821+00 | .617+00 | .617+00 | .821+00 | .103+01 | .644+00 |
| .2 | -.254 | -.216 | -.016 | -.054 | .558+00 | .608+00 | .964+00 | .884+00 | .825+00 | .829+00 |
| .4 | -.475 | -.280 | .120 | -.075 | .335+00 | .525+00 | .132+01 | .842+00 | .622+00 | .100+01 |
| .6 | -.752 | -.391 | .209 | -.152 | .177+00 | .406+00 | .162+01 | .704+00 | .443+00 | .116+01 |
| .8 | -1.083 | -.541 | .259 | -.283 | .826-01 | .288+00 | .182+01 | .521+00 | .299+00 | .129+01 |
| 1.0 | -1.450 | -.717 | .283 | -.450 | .355-01 | .192+00 | .192+01 | .355+00 | .195+00 | .139+01 |
| 1.2 | -1.836 | -.906 | .294 | -.635 | .146-01 | .124+00 | .197+01 | .231+00 | .125+00 | .145+01 |
| 1.4 | -2.230 | -1.102 | .298 | -.830 | .589-02 | .791-01 | .199+01 | .148+00 | .793-01 | .150+01 |
| 1.6 | -2.627 | -1.300 | .300 | -1.027 | .236-02 | .501-01 | .199+01 | .939-01 | .502-01 | .152+01 |
| 1.8 | -3.026 | -1.499 | .301 | -1.226 | .941-03 | .317-01 | .200+01 | .594-01 | .317-01 | .154+01 |
| 2.0 | -3.426 | -1.699 | .301 | -1.426 | .375-03 | .200-01 | .200+01 | .375-01 | .200-01 | .155+01 |
| 2.2 | -3.826 | -1.899 | .301 | -1.626 | .149-03 | .126-01 | .200+01 | .237-01 | .126-01 | .156+01 |
| 2.4 | -4.226 | -2.099 | .301 | -1.826 | .595-04 | .796-02 | .200+01 | .149-01 | .796-02 | .156+01 |
| 2.6 | -4.626 | -2.299 | .301 | -2.026 | .237-04 | .502-02 | .200+01 | .943-02 | .502-02 | .157+01 |
| 2.8 | -5.026 | -2.499 | .301 | -2.226 | .943-05 | .317-02 | .200+01 | .595-02 | .317-02 | .157+01 |
| 3.0 | -5.426 | -2.699 | .301 | -2.426 | .375-05 | .200-02 | .200+01 | .375-02 | .200-02 | .157+01 |
| 3.4 | -6.226 | -3.099 | .301 | -2.826 | .595-06 | .796-03 | .200+01 | .149-02 | .796-03 | .157+01 |
| 3.8 | -7.026 | -3.499 | .301 | -3.226 | .943-07 | .317-03 | .200+01 | .595-03 | .317-03 | .157+01 |
| 4.2 | -7.826 | -3.899 | .301 | -3.626 | .149-07 | .126-03 | .200+01 | .237-03 | .126-03 | .157+01 |
| 4.6 | -8.626 | -4.299 | .301 | -4.026 | .237-08 | .502-04 | .200+01 | .943-04 | .502-04 | .157+01 |
| 5.0 | -9.426 | -4.699 | .301 | -4.426 | .375-09 | .200-04 | .200+01 | .375-04 | .200-04 | .157+01 |

EXACT ZIMM EIGENVALUES N= 2 H*= .150

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JFR | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .850+00 | .230+01 | .435+00 | .161+01 | 1.369 | .730 | .157+01 | 1.1364 | .606 | 1.654 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG FTA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .137 | -2.744 | -5.544 | -2.663 | .137+01 | .180-02 | .285-05 | .217-02 | .137+01 | .132-02 |
| -2.0 | .136 | -1.945 | -3.945 | -1.864 | .137+01 | .114-01 | .114-03 | .137-01 | .137+01 | .830-02 |
| -1.8 | .136 | -1.745 | -3.545 | -1.664 | .137+01 | .180-01 | .285-03 | .217-01 | .137+01 | .132-01 |
| -1.4 | .136 | -1.345 | -2.745 | -1.264 | .137+01 | .452-01 | .180-02 | .544-01 | .137+01 | .330-01 |
| -1.0 | .133 | -.948 | -1.948 | -.867 | .136+01 | .113+00 | .113-01 | .136+00 | .136+01 | .827-01 |
| -.8 | .128 | -.754 | -1.554 | -.672 | .134+01 | .176+00 | .279-01 | .213+00 | .136+01 | .130+00 |
| -.6 | .116 | -.568 | -1.168 | -.484 | .131+01 | .270+00 | .679-01 | .328+00 | .133+01 | .204+00 |
| -.4 | .088 | -.401 | -.801 | -.312 | .122+01 | .397+00 | .158+00 | .489+00 | .129+01 | .313+00 |
| -.2 | .028 | -.273 | -.473 | -.172 | .107+01 | .573+00 | .336+00 | .672+00 | .119+01 | .464+00 |
| .0 | -.084 | -.208 | -.208 | -.084 | .825+00 | .620+00 | .620+00 | .825+00 | .103+01 | .644+00 |
| .2 | -.252 | -.213 | -.013 | -.052 | .560+00 | .612+00 | .970+00 | .887+00 | .830+00 | .830+00 |
| .4 | -.475 | -.278 | .122 | -.075 | .335+00 | .528+00 | .133+01 | .842+00 | .625+00 | .100+01 |
| .6 | -.754 | -.389 | .211 | -.154 | .176+00 | .408+00 | .162+01 | .701+00 | .444+00 | .116+01 |
| .8 | -1.037 | -.540 | .260 | -.287 | .819-01 | .288+00 | .182+01 | .517+00 | .300+00 | .129+01 |
| 1.0 | -1.454 | -.716 | .284 | -.454 | .351-01 | .192+00 | .192+01 | .351+00 | .195+00 | .139+01 |
| 1.2 | -1.840 | -.906 | .294 | -.640 | .144-01 | .124+00 | .197+01 | .229+00 | .125+00 | .146+01 |
| 1.4 | -2.235 | -1.102 | .298 | -.835 | .582-02 | .791-01 | .199+01 | .146+00 | .793-01 | .150+01 |
| 1.6 | -2.632 | -1.300 | .300 | -1.032 | .233-02 | .501-01 | .199+01 | .928-01 | .502-01 | .152+01 |
| 1.8 | -3.032 | -1.499 | .301 | -1.232 | .930-03 | .317-01 | .200+01 | .587-01 | .317-01 | .154+01 |
| 2.0 | -3.431 | -1.699 | .301 | -1.431 | .371-03 | .200-01 | .200+01 | .371-01 | .200-01 | .155+01 |
| 2.2 | -3.831 | -1.899 | .301 | -1.631 | .148-03 | .126-01 | .200+01 | .234-01 | .126-01 | .156+01 |
| 2.4 | -4.231 | -2.099 | .301 | -1.831 | .588-04 | .796-02 | .200+01 | .148-01 | .796-02 | .156+01 |
| 2.6 | -4.631 | -2.299 | .301 | -2.031 | .234-04 | .502-02 | .200+01 | .931-02 | .502-02 | .157+01 |
| 2.8 | -5.031 | -2.499 | .301 | -2.231 | .931-05 | .317-02 | .200+01 | .588-02 | .317-02 | .157+01 |
| 3.0 | -5.431 | -2.699 | .301 | -2.431 | .371-05 | .200-02 | .200+01 | .371-02 | .200-02 | .157+01 |
| 3.4 | -6.231 | -3.099 | .301 | -2.831 | .588-06 | .796-03 | .200+01 | .148-02 | .796-03 | .157+01 |
| 3.8 | -7.031 | -3.499 | .301 | -3.231 | .931-07 | .317-03 | .200+01 | .588-03 | .317-03 | .157+01 |
| 4.2 | -7.831 | -3.899 | .301 | -3.631 | .148-07 | .126-03 | .200+01 | .234-03 | .126-03 | .157+01 |
| 4.6 | -8.631 | -4.299 | .301 | -4.031 | .234-08 | .502-04 | .200+01 | .931-04 | .502-04 | .157+01 |
| 5.0 | -9.431 | -4.699 | .301 | -4.431 | .371-09 | .200-04 | .200+01 | .371-04 | .200-04 | .157+01 |

EXACT ZIMM EIGENVALUES N= 2 H*= .250

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .750+00 | .184+01 | .545+00 | .188+01 | 1.409 | .710 | .207+01 | 1.1669 | .588 | 3.214 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .149 | -2.733 | -5.533 | -2.651 | .141+01 | .185-02 | .293-05 | .223-02 | .141+01 | .131-02 |
| -2.0 | .149 | -1.933 | -3.933 | -1.851 | .141+01 | .117-01 | .117-03 | .141-01 | .141+01 | .828-02 |
| -1.8 | .149 | -1.733 | -3.533 | -1.651 | .141+01 | .185-01 | .293-03 | .223-01 | .141+01 | .131-01 |
| -1.4 | .148 | -1.334 | -2.734 | -1.252 | .141+01 | .464-01 | .185-02 | .560-01 | .141+01 | .330-01 |
| -1.0 | .145 | -.937 | -1.937 | -.855 | .140+01 | .115+00 | .116-01 | .140+00 | .140+01 | .826-01 |
| -.8 | .141 | -.742 | -1.542 | -.659 | .138+01 | .181+00 | .287-01 | .219+00 | .139+01 | .130+00 |
| -.6 | .129 | -.556 | -1.156 | -.471 | .134+01 | .278+00 | .698-01 | .338+00 | .137+01 | .204+00 |
| -.4 | .101 | -.389 | -.789 | -.299 | .126+01 | .408+00 | .163+00 | .502+00 | .133+01 | .313+00 |
| -.2 | .041 | -.260 | -.460 | -.159 | .110+01 | .550+00 | .347+00 | .693+00 | .123+01 | .464+00 |
| .0 | -.071 | -.192 | -.192 | -.071 | .850+00 | .643+00 | .643+00 | .850+00 | .107+01 | .648+00 |
| .2 | -.242 | -.195 | .005 | -.042 | .573+00 | .638+00 | .101+01 | .908+00 | .857+00 | .839+00 |
| .4 | -.474 | -.261 | .139 | -.074 | .336+00 | .548+00 | .138+01 | .843+00 | .643+00 | .102+01 |
| .6 | -.766 | -.378 | .222 | -.166 | .171+00 | .419+00 | .167+01 | .682+00 | .452+00 | .118+01 |
| .8 | -1.108 | -.534 | .266 | -.308 | .779-01 | .292+00 | .184+01 | .492+00 | .303+00 | .131+01 |
| 1.0 | -1.482 | -.714 | .286 | -.482 | .330-01 | .193+00 | .193+01 | .330+00 | .196+00 | .140+01 |
| 1.2 | -1.870 | -.905 | .295 | -.670 | .135-01 | .124+00 | .197+01 | .214+00 | .125+00 | .146+01 |
| 1.4 | -2.266 | -1.101 | .299 | -.866 | .543-02 | .792-01 | .199+01 | .136+00 | .794-01 | .150+01 |
| 1.6 | -2.664 | -1.300 | .300 | -1.064 | .217-02 | .501-01 | .200+01 | .864-01 | .502-01 | .153+01 |
| 1.8 | -3.063 | -1.499 | .301 | -1.263 | .865-03 | .317-01 | .200+01 | .546-01 | .317-01 | .154+01 |
| 2.0 | -3.463 | -1.699 | .301 | -1.463 | .345-03 | .200-01 | .200+01 | .345-01 | .200-01 | .155+01 |
| 2.2 | -3.863 | -1.899 | .301 | -1.663 | .137-03 | .126-01 | .200+01 | .217-01 | .126-01 | .156+01 |
| 2.4 | -4.262 | -2.099 | .301 | -1.862 | .546-04 | .796-02 | .200+01 | .137-01 | .796-02 | .156+01 |
| 2.6 | -4.662 | -2.299 | .301 | -2.062 | .218-04 | .502-02 | .200+01 | .866-02 | .502-02 | .157+01 |
| 2.8 | -5.062 | -2.499 | .301 | -2.262 | .866-05 | .317-02 | .200+01 | .546-02 | .317-02 | .157+01 |
| 3.0 | -5.462 | -2.699 | .301 | -2.462 | .345-05 | .200-02 | .200+01 | .345-02 | .200-02 | .157+01 |
| 3.4 | -6.262 | -3.099 | .301 | -2.862 | .546-06 | .796-03 | .200+01 | .137-02 | .796-03 | .157+01 |
| 3.8 | -7.062 | -3.499 | .301 | -3.262 | .866-07 | .317-03 | .200+01 | .546-03 | .317-03 | .157+01 |
| 4.2 | -7.862 | -3.899 | .301 | -3.662 | .137-07 | .126-03 | .200+01 | .218-03 | .126-03 | .157+01 |
| 4.6 | -8.662 | -4.299 | .301 | -4.062 | .218-08 | .502-04 | .200+01 | .866-04 | .502-04 | .157+01 |
| 5.0 | -9.462 | -4.699 | .301 | -4.462 | .345-09 | .200-04 | .200+01 | .345-04 | .200-04 | .157+01 |

EXACT ZIMM EIGENVALUES N= 4 H*= .075

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .375+00 | .317+01 | .315+00 | .420+01 | 1.573 | .636 | .802+01 | 1.1262 | .455 | .762 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .197 | -2.748 | -5.548 | -2.603 | .157+01 | .178-02 | .283-05 | .249-02 | .157+01 | .113-02 |
| -2.0 | .197 | -1.948 | -3.948 | -1.803 | .157+01 | .113-01 | .113-03 | .157-01 | .157+01 | .716-02 |
| -1.8 | .197 | -1.748 | -3.548 | -1.603 | .157+01 | .178-01 | .283-03 | .249-01 | .157+01 | .113-01 |
| -1.4 | .196 | -1.349 | -2.749 | -1.204 | .157+01 | .448-01 | .178-02 | .626-01 | .157+01 | .285-01 |
| -1.0 | .194 | -.952 | -1.952 | -.806 | .156+01 | .112+00 | .112-01 | .156+00 | .157+01 | .713-01 |
| -.8 | .190 | -.756 | -1.558 | -.610 | .155+01 | .175+00 | .277-01 | .245+00 | .156+01 | .112+00 |
| -.6 | .179 | -.572 | -1.172 | -.421 | .151+01 | .268+00 | .673-01 | .380+00 | .154+01 | .175+00 |
| -.4 | .156 | -.405 | -.805 | -.244 | .143+01 | .393+00 | .157+00 | .570+00 | .148+01 | .268+00 |
| -.2 | .106 | -.277 | -.477 | -.094 | .128+01 | .529+00 | .334+00 | .805+00 | .138+01 | .393+00 |
| .0 | .019 | -.209 | -.209 | .019 | .104+01 | .619+00 | .619+00 | .104+01 | .121+01 | .535+00 |
| .2 | -.102 | -.205 | -.005 | .098 | .791+00 | .624+00 | .988+00 | .125+01 | .101+01 | .667+00 |
| .4 | -.241 | -.242 | .158 | .159 | .574+00 | .572+00 | .144+01 | .144+01 | .810+00 | .784+00 |
| .6 | -.404 | -.301 | .299 | .196 | .394+00 | .500+00 | .199+01 | .157+01 | .637+00 | .903+00 |
| .8 | -.609 | -.383 | .417 | .191 | .246+00 | .414+00 | .261+01 | .155+01 | .482+00 | .104+01 |
| 1.0 | -.871 | -.496 | .504 | .129 | .135+00 | .319+00 | .319+01 | .135+01 | .346+00 | .117+01 |
| 1.2 | -1.190 | -.644 | .556 | .010 | .646-01 | .227+00 | .360+01 | .102+01 | .236+00 | .129+01 |
| 1.4 | -1.550 | -.818 | .582 | -.150 | .282-01 | .152+00 | .382+01 | .709+00 | .155+00 | .139+01 |
| 1.6 | -1.932 | -1.006 | .594 | -.332 | .117-01 | .986-01 | .393+01 | .466+00 | .993-01 | .145+01 |
| 1.8 | -2.324 | -1.201 | .599 | -.524 | .474-02 | .629-01 | .397+01 | .299+00 | .631-01 | .150+01 |
| 2.0 | -2.721 | -1.399 | .601 | -.721 | .190-02 | .399-01 | .399+01 | .190+00 | .399-01 | .152+01 |
| 2.2 | -3.120 | -1.598 | .602 | -.920 | .759-03 | .252-01 | .400+01 | .120+00 | .252-01 | .154+01 |
| 2.4 | -3.520 | -1.798 | .602 | -1.120 | .302-03 | .159-01 | .400+01 | .759-01 | .159-01 | .155+01 |
| 2.6 | -3.919 | -1.998 | .602 | -1.319 | .120-03 | .100-01 | .400+01 | .479-01 | .100-01 | .156+01 |
| 2.8 | -4.319 | -2.198 | .602 | -1.519 | .479-04 | .634-02 | .400+01 | .302-01 | .634-02 | .156+01 |
| 3.0 | -4.719 | -2.398 | .602 | -1.719 | .191-04 | .400-02 | .400+01 | .191-01 | .400-02 | .157+01 |
| 3.4 | -5.519 | -2.798 | .602 | -2.119 | .303-05 | .159-02 | .400+01 | .760-02 | .159-02 | .157+01 |
| 3.8 | -6.319 | -3.198 | .602 | -2.519 | .479-06 | .634-03 | .400+01 | .303-02 | .634-03 | .157+01 |
| 4.2 | -7.119 | -3.598 | .602 | -2.919 | .760-07 | .252-03 | .400+01 | .120-02 | .252-03 | .157+01 |
| 4.6 | -7.919 | -3.998 | .602 | -3.319 | .120-07 | .100-03 | .400+01 | .479-03 | .100-03 | .157+01 |
| 5.0 | -8.719 | -4.398 | .602 | -3.719 | .191-08 | .400-04 | .400+01 | .191-03 | .400-04 | .157+01 |

EXACT ZIMM EIGENVALUES N= 4 H*= .10

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIPROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .372+00 | .302+01 | .331+00 | .427+01 | 1.590 | .629 | .818+01 | 1.1332 | .448 | 1.034 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .201 | -2.746 | -5.546 | -2.599 | .159+01 | .180-02 | .285-05 | .252-02 | .159+01 | .113-02 |
| -2.0 | .201 | -1.946 | -3.946 | -1.799 | .159+01 | .113-01 | .113-03 | .159-01 | .159+01 | .713-02 |
| -1.8 | .201 | -1.746 | -3.546 | -1.599 | .159+01 | .180-01 | .285-03 | .252-01 | .159+01 | .113-01 |
| -1.4 | .201 | -1.346 | -2.746 | -1.199 | .159+01 | .451-01 | .179-02 | .632-01 | .159+01 | .284-01 |
| -1.0 | .199 | -.950 | -1.950 | -.801 | .158+01 | .112+00 | .112-01 | .158+00 | .158+01 | .710-01 |
| -.8 | .194 | -.755 | -1.555 | -.606 | .156+01 | .176+00 | .278-01 | .248+00 | .157+01 | .112+00 |
| -.6 | .184 | -.563 | -1.169 | -.416 | .153+01 | .270+00 | .677-01 | .384+00 | .155+01 | .175+00 |
| -.4 | .161 | -.402 | -.802 | -.239 | .145+01 | .396+00 | .158+00 | .576+00 | .150+01 | .267+00 |
| -.2 | .111 | -.273 | -.473 | -.089 | .129+01 | .533+00 | .336+00 | .815+00 | .140+01 | .391+00 |
| .0 | .025 | -.204 | -.204 | .025 | .106+01 | .625+00 | .625+00 | .106+01 | .123+01 | .533+00 |
| .2 | -.095 | -.199 | .001 | .105 | .804+00 | .632+00 | .100+01 | .127+01 | .102+01 | .666+00 |
| .4 | -.235 | -.235 | .165 | .165 | .582+00 | .582+00 | .146+01 | .146+01 | .823+00 | .785+00 |
| .6 | -.400 | -.293 | .307 | .200 | .398+00 | .509+00 | .203+01 | .158+01 | .646+00 | .908+00 |
| .8 | -.609 | -.375 | .425 | .191 | .246+00 | .421+00 | .266+01 | .155+01 | .488+00 | .104+01 |
| 1.0 | -.876 | -.491 | .509 | .124 | .133+00 | .323+00 | .323+01 | .133+01 | .349+00 | .118+01 |
| 1.2 | -1.199 | -.641 | .559 | .001 | .632-01 | .228+00 | .362+01 | .100+01 | .237+00 | .130+01 |
| 1.4 | -1.562 | -.817 | .593 | -.162 | .274-01 | .153+00 | .393+01 | .689+00 | .155+00 | .139+01 |
| 1.6 | -1.945 | -1.006 | .594 | -.345 | .113-01 | .987-01 | .393+01 | .451+00 | .994-01 | .146+01 |
| 1.8 | -2.339 | -1.201 | .599 | -.539 | .459-02 | .629-01 | .397+01 | .289+00 | .631-01 | .150+01 |
| 2.0 | -2.736 | -1.399 | .601 | -.736 | .184-02 | .399-01 | .399+01 | .184+00 | .399-01 | .152+01 |
| 2.2 | -3.135 | -1.598 | .602 | -.935 | .733-03 | .252-01 | .400+01 | .116+00 | .252-01 | .154+01 |
| 2.4 | -3.534 | -1.798 | .602 | -1.134 | .292-03 | .159-01 | .400+01 | .734-01 | .159-01 | .155+01 |
| 2.6 | -3.934 | -1.998 | .602 | -1.334 | .116-03 | .100-01 | .400+01 | .463-01 | .100-01 | .156+01 |
| 2.8 | -4.334 | -2.198 | .602 | -1.534 | .464-04 | .634-02 | .400+01 | .292-01 | .634-02 | .156+01 |
| 3.0 | -4.734 | -2.398 | .602 | -1.734 | .185-04 | .400-02 | .400+01 | .185-01 | .400-02 | .157+01 |
| 3.4 | -5.534 | -2.798 | .602 | -2.134 | .292-05 | .159-02 | .400+01 | .735-02 | .159-02 | .157+01 |
| 3.8 | -6.334 | -3.198 | .602 | -2.534 | .464-06 | .634-03 | .400+01 | .292-02 | .634-03 | .157+01 |
| 4.2 | -7.134 | -3.598 | .602 | -2.934 | .735-07 | .252-03 | .400+01 | .116-02 | .252-03 | .157+01 |
| 4.6 | -7.934 | -3.998 | .602 | -3.334 | .116-07 | .100-03 | .400+01 | .464-03 | .100-03 | .157+01 |
| 5.0 | -8.734 | -4.398 | .602 | -3.734 | .185-08 | .400-04 | .400+01 | .185-03 | .400-04 | .157+01 |



#1250

EXACT ZIMM EIGENVALUES N= 4 H*= .130

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIPROCAL | SUM (1/LP)2 | SUM(L1/LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .369+00 | .284+01 | .352+00 | .437+01 | 1.613 | .620 | .838+01 | 1.1426 | .439 | 1.374 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .208 | -2.742 | -5.542 | -2.592 | .161+01 | .181-02 | .287-05 | .256-02 | .161+01 | .112-02 |
| -2.0 | .208 | -1.942 | -3.942 | -1.792 | .161+01 | .114-01 | .114-03 | .161-01 | .161+01 | .708-02 |
| -1.8 | .208 | -1.742 | -3.542 | -1.592 | .161+01 | .181-01 | .287-03 | .256-01 | .161+01 | .112-01 |
| -1.4 | .207 | -1.343 | -2.743 | -1.193 | .161+01 | .454-01 | .181-02 | .641-01 | .161+01 | .282-01 |
| -1.0 | .205 | -.946 | -1.946 | -.795 | .160+01 | .113+00 | .113-01 | .160+00 | .161+01 | .706-01 |
| -.8 | .201 | -.752 | -1.552 | -.599 | .159+01 | .177+00 | .281-01 | .252+00 | .160+01 | .111+00 |
| -.6 | .191 | -.566 | -1.166 | -.409 | .155+01 | .272+00 | .683-01 | .390+00 | .157+01 | .174+00 |
| -.4 | .167 | -.398 | -.798 | -.233 | .147+01 | .400+00 | .159+00 | .585+00 | .152+01 | .265+00 |
| -.2 | .119 | -.269 | -.469 | -.091 | .131+01 | .529+00 | .340+00 | .829+00 | .142+01 | .389+00 |
| .0 | .033 | -.199 | -.199 | .033 | .108+01 | .633+00 | .633+00 | .108+01 | .125+01 | .531+00 |
| .2 | -.086 | -.191 | .009 | .114 | .820+00 | .644+00 | .102+01 | .130+01 | .104+01 | .665+00 |
| .4 | -.227 | -.225 | .175 | .173 | .593+00 | .595+00 | .150+01 | .149+01 | .840+00 | .787+00 |
| .6 | -.395 | -.282 | .318 | .205 | .402+00 | .522+00 | .208+01 | .160+01 | .659+00 | .914+00 |
| .8 | -.610 | -.366 | .434 | .190 | .245+00 | .430+00 | .272+01 | .155+01 | .495+00 | .105+01 |
| 1.0 | -.884 | -.485 | .515 | .116 | .131+00 | .327+00 | .327+01 | .131+01 | .353+00 | .119+01 |
| 1.2 | -1.212 | -.638 | .562 | -.012 | .614-01 | .230+00 | .365+01 | .973+00 | .238+00 | .131+01 |
| 1.4 | -1.578 | -.815 | .585 | -.178 | .264-01 | .153+00 | .385+01 | .664+00 | .155+00 | .140+01 |
| 1.6 | -1.963 | -1.005 | .595 | -.363 | .109-01 | .989-01 | .394+01 | .434+00 | .995-01 | .146+01 |
| 1.8 | -2.357 | -1.201 | .599 | -.557 | .440-02 | .630-01 | .397+01 | .278+00 | .631-01 | .150+01 |
| 2.0 | -2.754 | -1.399 | .601 | -.754 | .176-02 | .399-01 | .399+01 | .176+00 | .399-01 | .153+01 |
| 2.2 | -3.153 | -1.598 | .602 | -.953 | .703-03 | .252-01 | .400+01 | .111+00 | .252-01 | .154+01 |
| 2.4 | -3.553 | -1.798 | .602 | -1.153 | .280-03 | .159-01 | .400+01 | .704-01 | .159-01 | .155+01 |
| 2.6 | -3.953 | -1.998 | .602 | -1.353 | .112-03 | .100-01 | .400+01 | .444-01 | .100-01 | .156+01 |
| 2.8 | -4.352 | -2.198 | .602 | -1.552 | .444-04 | .634-02 | .400+01 | .280-01 | .634-02 | .156+01 |
| 3.0 | -4.752 | -2.398 | .602 | -1.752 | .177-04 | .400-02 | .400+01 | .177-01 | .400-02 | .157+01 |
| 3.4 | -5.552 | -2.798 | .602 | -2.152 | .280-05 | .159-02 | .400+01 | .704-02 | .159-02 | .157+01 |
| 3.8 | -6.352 | -3.198 | .602 | -2.552 | .444-06 | .634-03 | .400+01 | .280-02 | .634-03 | .157+01 |
| 4.2 | -7.152 | -3.598 | .602 | -2.952 | .704-07 | .252-03 | .400+01 | .112-02 | .252-03 | .157+01 |
| 4.6 | -7.952 | -3.998 | .602 | -3.352 | .112-07 | .100-03 | .400+01 | .444-03 | .100-03 | .157+01 |
| 5.0 | -8.752 | -4.398 | .602 | -3.752 | .177-08 | .400-04 | .400+01 | .177-03 | .400-04 | .157+01 |

EXACT ZIMM EIGENVALUES N= 4 H*= .150

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .367+00 | .272+01 | .367+00 | .444+01 | 1.629 | .614 | .853+01 | 1.1495 | .433 | 1.611 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .212 | -2.739 | -5.539 | -2.588 | .163+01 | .182-02 | .289-05 | .258-02 | .163+01 | .112-02 |
| -2.0 | .212 | -1.940 | -3.340 | -1.788 | .163+01 | .115-01 | .115-03 | .163-01 | .163+01 | .706-02 |
| -1.8 | .212 | -1.740 | -3.540 | -1.588 | .163+01 | .182-01 | .289-03 | .258-01 | .163+01 | .112-01 |
| -1.4 | .212 | -1.340 | -2.740 | -1.188 | .163+01 | .457-01 | .182-02 | .648-01 | .163+01 | .281-01 |
| -1.0 | .209 | -.943 | -1.943 | -.791 | .162+01 | .114+00 | .114-01 | .162+00 | .162+01 | .703-01 |
| -.8 | .205 | -.749 | -1.549 | -.595 | .160+01 | .178+00 | .283-01 | .254+00 | .161+01 | .111+00 |
| -.6 | .195 | -.563 | -1.163 | -.405 | .157+01 | .2[illegible]4+00 | .687-01 | .394+00 | .159+01 | .173+00 |
| -.4 | .172 | -.395 | -.795 | -.228 | .149+01 | .402+00 | .160+00 | .592+00 | .154+01 | .264+00 |
| -.2 | .124 | -.265 | -.465 | -.076 | .133+01 | .543+00 | .343+00 | .839+00 | .144+01 | .338+00 |
| .0 | .039 | -.194 | -.194 | .039 | .109+01 | .639+00 | .639+00 | .109+01 | .127+01 | .529+00 |
| .2 | -.080 | -.186 | .014 | .120 | .832+00 | .652+00 | .103+01 | .132+01 | .106+01 | .665+00 |
| .4 | -.221 | -.218 | .182 | .179 | .601+00 | .605+00 | .152+01 | .151+01 | .853+00 | .789+00 |
| .6 | -.392 | -.275 | .325 | .208 | .405+00 | .531+00 | .211+01 | .161+01 | .668+00 | .919+00 |
| .8 | -.611 | -.360 | .440 | .189 | .245+00 | .437+00 | .275+01 | .155+01 | .501+00 | .106+01 |
| 1.0 | -.889 | -.481 | .519 | .111 | .129+00 | .331+00 | .331+01 | .129+01 | .355+00 | .120+01 |
| 1.2 | -1.221 | -.636 | .564 | -.021 | .601-01 | .231+00 | .367+01 | .952+00 | .239+00 | .132+01 |
| 1.4 | -1.589 | -.814 | .586 | -.189 | .258-01 | .153+00 | .386+01 | .647+00 | .156+00 | .140+01 |
| 1.6 | -1.975 | -1.004 | .596 | -.375 | .106-01 | .990-01 | .394+01 | .422+00 | .995-01 | .146+01 |
| 1.8 | -2.369 | -1.201 | .599 | -.569 | .427-02 | .630-01 | .398+01 | .270+00 | .632-01 | .150+01 |
| 2.0 | -2.757 | -1.399 | .601 | -.767 | .171-02 | .399-01 | .399+01 | .171+00 | .399-01 | .153+01 |
| 2.2 | -3.166 | -1.598 | .602 | -.966 | .682-03 | .252-01 | .400+01 | .108+00 | .252-01 | .154+01 |
| 2.4 | -3.566 | -1.798 | .602 | -1.166 | .272-03 | .159-01 | .400+01 | .683-01 | .159-01 | .155+01 |
| 2.6 | -3.965 | -1.998 | .602 | -1.365 | .108-03 | .100-01 | .400+01 | .431-01 | .100-01 | .156+01 |
| 2.8 | -4.365 | -2.198 | .602 | -1.565 | .431-04 | .634-02 | .400+01 | .272-01 | .634-02 | .156+01 |
| 3.0 | -4.765 | -2.398 | .602 | -1.765 | .172-04 | .400-02 | .400+01 | .172-01 | .400-02 | .157+01 |
| 3.4 | -5.565 | -2.798 | .602 | -2.165 | .272-05 | .159-02 | .400+01 | .683-02 | .159-02 | .157+01 |
| 3.6 | -6.365 | -3.198 | .602 | -2.565 | .431-06 | .634-03 | .400+01 | .272-02 | .634-03 | .157+01 |
| 4.2 | -7.165 | -3.598 | .602 | -2.965 | .683-07 | .252-03 | .400+01 | .108-02 | .252-03 | .157+01 |
| 4.6 | -7.965 | -3.998 | .602 | -3.365 | .108-07 | .100-03 | .400+01 | .431-03 | .100-03 | .157+01 |
| 5.0 | -8.765 | -4.398 | .602 | -3.765 | .172-08 | .400-04 | .400+01 | .172-03 | .400-04 | .157+01 |



#1250

EXACT ZIMM EIGENVALUES  N= 4  H*= .20

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .362+00 | .242+01 | .413+00 | .463+01 | 1.675 | .597 | .832+01 | 1.1699 | .417 | 2.240 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .224 | -2.732 | -5.532 | -2.576 | .168+01 | .185-02 | .294-05 | .266-02 | .168+01 | .111-02 |
| -2.0 | .224 | -1.932 | -3.932 | -1.776 | .158+01 | .117-01 | .117-03 | .168-01 | .168+01 | .698-02 |
| -1.8 | .224 | -1.732 | -3.532 | -1.576 | .163+01 | .185-01 | .294-03 | .265-01 | .168+01 | .111-01 |
| -1.4 | .224 | -1.332 | -2.732 | -1.176 | .157+01 | .465-01 | .185-02 | .666-01 | .167+01 | .278-01 |
| -1.0 | .221 | -.936 | -1.936 | -.773 | .156+01 | .116+00 | .116-01 | .166+00 | .167+01 | .695-01 |
| -.8 | .217 | -.741 | -1.541 | -.583 | .155+01 | .181+00 | .288-01 | .261+00 | .156+01 | .110+00 |
| -.6 | .208 | -.555 | -1.155 | -.392 | .161+01 | .279+00 | .700-01 | .405+00 | .164+01 | .171+00 |
| -.4 | .185 | -.387 | -.787 | -.215 | .153+01 | .410+00 | .163+00 | .610+00 | .159+01 | .262+00 |
| -.2 | .138 | -.256 | -.456 | -.062 | .137+01 | .555+00 | .350+00 | .856+00 | .148+01 | .384+00 |
| .0 | .054 | -.182 | -.182 | .054 | .113+01 | .657+00 | .657+00 | .113+01 | .131+01 | .526+00 |
| .2 | -.064 | -.170 | .030 | .136 | .864+00 | .676+00 | .107+01 | .137+01 | .110+01 | .664+00 |
| .4 | -.207 | -.199 | .201 | .193 | .621+00 | .632+00 | .159+01 | .156+01 | .896+00 | .795+00 |
| .6 | -.335 | -.255 | .345 | .215 | .412+00 | .556+00 | .221+01 | .164+01 | .692+00 | .932+00 |
| .8 | -.615 | -.343 | .457 | .185 | .243+00 | .454+00 | .296+01 | .153+01 | .514+00 | .108+01 |
| 1.0 | -.905 | -.470 | .530 | .095 | .124+00 | .339+00 | .339+01 | .124+01 | .361+00 | .122+01 |
| 1.2 | -1.247 | -.630 | .570 | -.047 | .567-01 | .234+00 | .371+01 | .898+00 | .241+00 | .133+01 |
| 1.4 | -1.620 | -.811 | .589 | -.220 | .240-01 | .154+00 | .338+01 | .603+00 | .156+00 | .142+01 |
| 1.6 | -2.008 | -1.003 | .597 | -.408 | .982-02 | .992-01 | .395+01 | .391+00 | .997-01 | .147+01 |
| 1.8 | -2.403 | -1.200 | .600 | -.603 | .395-02 | .631-01 | .398+01 | .249+00 | .632-01 | .151+01 |
| 2.0 | -2.801 | -1.399 | .601 | -.801 | .158-02 | .399-01 | .399+01 | .158+00 | .400-01 | .153+01 |
| 2.2 | -3.201 | -1.598 | .602 | -1.001 | .630-03 | .252-01 | .400+01 | .999-01 | .252-01 | .155+01 |
| 2.4 | -3.600 | -1.798 | .602 | -1.200 | .251-03 | .159-01 | .400+01 | .630-01 | .159-01 | .156+01 |
| 2.6 | -4.000 | -1.993 | .602 | -1.400 | .100-03 | .100-01 | .400+01 | .398-01 | .100-01 | .156+01 |
| 2.8 | -4.400 | -2.198 | .602 | -1.600 | .398-04 | .634-02 | .400+01 | .251-01 | .634-02 | .156+01 |
| 3.0 | -4.800 | -2.398 | .602 | -1.800 | .158-04 | .400-02 | .400+01 | .158-01 | .400-02 | .157+01 |
| 3.4 | -5.600 | -2.798 | .602 | -2.200 | .251-05 | .159-02 | .400+01 | .631-02 | .159-02 | .157+01 |
| 3.8 | -6.400 | -3.198 | .602 | -2.600 | .398-06 | .634-03 | .400+01 | .251-02 | .634-03 | .157+01 |
| 4.2 | -7.200 | -3.598 | .602 | -3.000 | .631-07 | .252-03 | .400+01 | .100-02 | .252-03 | .157+01 |
| 4.6 | -8.000 | -3.998 | .602 | -3.400 | .100-07 | .100-03 | .400+01 | .398-03 | .100-03 | .157+01 |
| 5.0 | -8.800 | -4.398 | .602 | -3.800 | .158-08 | .400-04 | .400+01 | .158-03 | .400-04 | .157+01 |

EXACT ZIMM EIGENVALUES N= 4 H*= .250

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .357+00 | .213+01 | .471+00 | .485+01 | 1.731 | .578 | .939+01 | 1.1959 | .399 | 2.935 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .238 | -2.722 | -5.522 | -2.562 | .173+01 | .190-02 | .300-05 | .274-02 | .173+01 | .109-02 |
| -2.0 | .238 | -1.922 | -3.922 | -1.762 | .173+01 | .120-01 | .120-03 | .173-01 | .173+01 | .691-02 |
| -1.8 | .238 | -1.722 | -3.522 | -1.562 | .173+01 | .190-01 | .300-03 | .274-01 | .173+01 | .109-01 |
| -1.4 | .238 | -1.323 | -2.723 | -1.162 | .173+01 | .475-01 | .189-02 | .689-01 | .173+01 | .275-01 |
| -1.0 | .236 | -.926 | -1.926 | -.764 | .172+01 | .119+00 | .119-01 | .172+00 | .172+01 | .686-01 |
| -.8 | .232 | -.731 | -1.531 | -.568 | .171+01 | .186+00 | .294-01 | .270+00 | .172+01 | .108+00 |
| -.6 | .222 | -.545 | -1.145 | -.378 | .167+01 | .285+00 | .716-01 | .419+00 | .169+01 | .169+00 |
| -.4 | .200 | -.376 | -.776 | -.200 | .159+01 | .421+00 | .167+00 | .631+00 | .164+01 | .259+00 |
| -.2 | .154 | -.244 | -.444 | -.045 | .142+01 | .571+00 | .360+00 | .899+00 | .153+01 | .381+00 |
| .0 | .072 | -.163 | -.168 | .072 | .118+01 | .680+00 | .680+00 | .118+01 | .136+01 | .523+00 |
| .2 | -.045 | -.151 | .049 | .155 | .901+00 | .706+00 | .112+01 | .143+01 | .114+01 | .665+00 |
| .4 | -.192 | -.176 | .224 | .208 | .643+00 | .666+00 | .167+01 | .161+01 | .926+00 | .803+00 |
| .6 | -.378 | -.233 | .367 | .222 | .418+00 | .585+00 | .233+01 | .167+01 | .719+00 | .950+00 |
| .8 | -.621 | -.326 | .474 | .179 | .239+00 | .472+00 | .298+01 | .151+01 | .529+00 | .110+01 |
| 1.0 | -.926 | -.459 | .541 | .074 | .119+00 | .347+00 | .347+01 | .119+01 | .367+00 | .124+01 |
| 1.2 | -1.277 | -.625 | .575 | -.077 | .529-01 | .237+00 | .376+01 | .838+00 | .243+00 | .135+01 |
| 1.4 | -1.655 | -.809 | .591 | -.255 | .222-01 | .155+00 | .390+01 | .557+00 | .157+00 | .143+01 |
| 1.6 | -2.045 | -1.002 | .598 | -.445 | .901-02 | .994-01 | .396+01 | .359+00 | .998-01 | .148+01 |
| 1.8 | -2.441 | -1.200 | .600 | -.641 | .362-02 | .631-01 | .398+01 | .228+00 | .632-01 | .151+01 |
| 2.0 | -2.840 | -1.393 | .601 | -.840 | .145-02 | .399-01 | .399+01 | .145+00 | .400-01 | .153+01 |
| 2.2 | -3.239 | -1.598 | .602 | -1.039 | .576-03 | .252-01 | .400+01 | .913-01 | .252-01 | .155+01 |
| 2.4 | -3.639 | -1.798 | .602 | -1.239 | .230-03 | .159-01 | .400+01 | .577-01 | .159-01 | .156+01 |
| 2.6 | -4.039 | -1.998 | .602 | -1.439 | .914-04 | .100-01 | .400+01 | .364-01 | .100-01 | .156+01 |
| 2.8 | -4.439 | -2.198 | .602 | -1.639 | .364-04 | .634-02 | .400+01 | .230-01 | .634-02 | .157+01 |
| 3.0 | -4.839 | -2.398 | .602 | -1.839 | .145-04 | .400-02 | .400+01 | .145-01 | .400-02 | .157+01 |
| 3.4 | -5.639 | -2.798 | .602 | -2.239 | .230-05 | .159-02 | .400+01 | .577-02 | .159-02 | .157+01 |
| 3.8 | -6.439 | -3.198 | .602 | -2.639 | .364-06 | .634-03 | .400+01 | .230-02 | .634-03 | .157+01 |
| 4.2 | -7.239 | -3.598 | .602 | -3.039 | .577-07 | .252-03 | .400+01 | .914-03 | .252-03 | .157+01 |
| 4.6 | -8.039 | -3.998 | .602 | -3.439 | .914-08 | .100-03 | .400+01 | .364-03 | .100-03 | .157+01 |
| 5.0 | -8.839 | -4.398 | .602 | -3.839 | .145-08 | .400-04 | .400+01 | .145-03 | .400-04 | .157+01 |



#1250

EXACT ZIMM EIGENVALUES N= 9 H*= .075

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JFR | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .129+00 | .339+01 | .295+00 | .131+02 | 1.690 | .592 | .667+02 | 1.1129 | .390 | .840 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .228 | -2.754 | -5.554 | -2.572 | .169+01 | .176-02 | .280-05 | .268-02 | .169+01 | .104-02 |
| -2.0 | .228 | -1.954 | -3.954 | -1.772 | .169+01 | .111-01 | .111-03 | .169-01 | .169+01 | .658-02 |
| -1.8 | .228 | -1.754 | -3.554 | -1.572 | .169+01 | .175-01 | .279-03 | .268-01 | .169+01 | .104-01 |
| -1.4 | .228 | -1.354 | -2.754 | -1.172 | .169+01 | .442-01 | .176-02 | .672-01 | .169+01 | .262-01 |
| -1.0 | .225 | -.957 | -1.957 | -.775 | .168+01 | .110+00 | .110-01 | .168+00 | .168+01 | .656-01 |
| -.8 | .221 | -.763 | -1.563 | -.579 | .167+01 | .172+00 | .273-01 | .264+00 | .167+01 | .103+00 |
| -.6 | .212 | -.578 | -1.178 | -.388 | .163+01 | .265+00 | .664-01 | .409+00 | .165+01 | .161+00 |
| -.4 | .190 | -.411 | -.811 | -.210 | .155+01 | .388+00 | .155+00 | .617+00 | .160+01 | .245+00 |
| -.2 | .145 | -.283 | -.483 | -.055 | .140+01 | .521+00 | .329+00 | .881+00 | .149+01 | .357+00 |
| .0 | .067 | -.217 | -.217 | .067 | .117+01 | .607+00 | .607+00 | .117+01 | .132+01 | .480+00 |
| .2 | -.036 | -.216 | -.016 | .164 | .921+00 | .609+00 | .964+00 | .146+01 | .110+01 | .584+00 |
| .4 | -.146 | -.254 | .146 | .254 | .714+00 | .557+00 | .140+01 | .179+01 | .906+00 | .662+00 |
| .6 | -.261 | -.306 | .294 | .339 | .549+00 | .494+00 | .197+01 | .218+01 | .738+00 | .733+00 |
| .8 | -.337 | -.366 | .434 | .413 | .410+00 | .431+00 | .272+01 | .259+01 | .595+00 | .810+00 |
| 1.0 | -.536 | -.433 | .567 | .464 | .291+00 | .369+00 | .369+01 | .291+01 | .470+00 | .902+00 |
| 1.2 | -.720 | -.515 | .685 | .480 | .191+00 | .306+00 | .485+01 | .302+01 | .360+00 | .101+01 |
| 1.4 | -.956 | -.620 | .780 | .444 | .111+00 | .240+00 | .602+01 | .278+01 | .264+00 | .114+01 |
| 1.6 | -1.253 | -.758 | .842 | .347 | .559-01 | .175+00 | .695+01 | .222+01 | .183+00 | .126+01 |
| 1.8 | -1.598 | -.924 | .876 | .202 | .252-01 | .119+00 | .752+01 | .159+01 | .122+00 | .136+01 |
| 2.0 | -1.973 | -1.108 | .892 | .027 | .106-01 | .779-01 | .779+01 | .106+01 | .787-01 | .144+01 |
| 2.2 | -2.363 | -1.302 | .898 | -.163 | .434-02 | .499-01 | .792+01 | .687+00 | .501-01 | .148+01 |
| 2.4 | -2.759 | -1.499 | .901 | -.359 | .174-02 | .317-01 | .797+01 | .439+00 | .318-01 | .152+01 |
| 2.6 | -3.157 | -1.698 | .902 | -.557 | .697-03 | .201-01 | .799+01 | .277+00 | .201-01 | .154+01 |
| 2.8 | -3.556 | -1.897 | .903 | -.756 | .278-03 | .127-01 | .799+01 | .175+00 | .127-01 | .155+01 |
| 3.0 | -3.956 | -2.097 | .903 | -.955 | .111-03 | .800-02 | .800+01 | .111+00 | .800-02 | .156+01 |
| 3.4 | -4.756 | -2.497 | .903 | -1.356 | .176-04 | .318-02 | .800+01 | .441-01 | .318-02 | .157+01 |
| 3.8 | -5.556 | -2.897 | .903 | -1.756 | .278-05 | .127-02 | .800+01 | .176-01 | .127-02 | .157+01 |
| 4.2 | -6.356 | -3.297 | .903 | -2.156 | .441-05 | .505-03 | .800+01 | .699-02 | .505-03 | .157+01 |
| 4.6 | -7.156 | -3.697 | .903 | -2.556 | .699-07 | .201-03 | .800+01 | .278-02 | .201-03 | .157+01 |
| 5.0 | -7.956 | -4.097 | .903 | -2.956 | .111-07 | .800-04 | .800+01 | .111-02 | .800-04 | .157+01 |

#1250

EXACT ZIMM EIGENVALUES N= 8 H*= .10

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .132+00 | .322+01 | .310+00 | .130+02 | 1.720 | .581 | .644+02 | 1.1205 | .379 | 1.116 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MCD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .236 | -2.751 | -5.551 | -2.564 | .172+01 | .178-02 | .281-05 | .273-02 | .172+01 | .103-02 |
| -2.0 | .236 | -1.951 | -3.951 | -1.764 | .172+01 | .112-01 | .112-03 | .172-01 | .172+01 | .651-02 |
| -1.6 | .236 | -1.751 | -3.551 | -1.564 | .172+01 | .178-01 | .281-03 | .273-01 | .172+01 | .103-01 |
| -1.4 | .235 | -1.351 | -2.751 | -1.165 | .172+01 | .445-01 | .177-02 | .684-01 | .172+01 | .259-01 |
| -1.0 | .233 | -.954 | -1.954 | -.767 | .171+01 | .111+00 | .111-01 | .171+00 | .171+01 | .646-01 |
| -.8 | .229 | -.760 | -1.550 | -.571 | .170+01 | .174+00 | .275-01 | .269+00 | .170+01 | .102+00 |
| -.6 | .220 | -.574 | -1.174 | -.380 | .156+01 | .266+00 | .669-01 | .417+00 | .168+01 | .159+00 |
| -.4 | .198 | -.408 | -.808 | -.202 | .158+01 | .391+00 | .156+00 | .629+00 | .163+01 | .243+00 |
| -.2 | .154 | -.279 | -.479 | -.046 | .143+01 | .526+00 | .332+00 | .899+00 | .152+01 | .353+00 |
| .0 | .077 | -.212 | -.212 | .077 | .119+01 | .614+00 | .614+00 | .119+01 | .134+01 | .475+00 |
| .2 | -.024 | -.209 | -.009 | .176 | .947+00 | .618+00 | .980+00 | .150+01 | .113+01 | .579+00 |
| .4 | -.133 | -.244 | .156 | .267 | .736+00 | .570+00 | .143+01 | .185+01 | .931+00 | .658+00 |
| .6 | -.248 | -.294 | .306 | .352 | .565+00 | .508+00 | .202+01 | .225+01 | .760+00 | .732+00 |
| .8 | -.376 | -.352 | .448 | .424 | .421+00 | .445+00 | .281+01 | .266+01 | .612+00 | .813+00 |
| 1.0 | -.528 | -.418 | .592 | .472 | .297+00 | .382+00 | .392+01 | .297+01 | .487+00 | .910+00 |
| 1.2 | -.718 | -.501 | .699 | .482 | .191+00 | .316+00 | .500+01 | .303+01 | .359+00 | .107+01 |
| 1.4 | -.964 | -.610 | .790 | .436 | .109+00 | .246+00 | .617+01 | .273+01 | .259+00 | .115+01 |
| 1.6 | -1.269 | -.751 | .849 | .331 | .539-01 | .177+00 | .706+01 | .214+01 | .185+00 | .128+01 |
| 1.8 | -1.620 | -.921 | .879 | .180 | .240-01 | .120+00 | .757+01 | .151+01 | .122+00 | .137+01 |
| 2.0 | -1.998 | -1.107 | .893 | .002 | .100-01 | .782-01 | .782+01 | .100+01 | .789-01 | .144+01 |
| 2.2 | -2.389 | -1.301 | .899 | -.189 | .409-02 | .500-01 | .793+01 | .647+00 | .502-01 | .149+01 |
| 2.4 | -2.785 | -1.499 | .901 | -.385 | .164-02 | .317-01 | .797+01 | .412+00 | .318-01 | .152+01 |
| 2.6 | -3.183 | -1.698 | .902 | -.583 | .655-03 | .201-01 | .799+01 | .261+00 | .201-01 | .154+01 |
| 2.8 | -3.583 | -1.897 | .903 | -.783 | .261-03 | .127-01 | .800+01 | .165+00 | .127-01 | .155+01 |
| 3.0 | -3.983 | -2.097 | .903 | -.983 | .104-03 | .800-02 | .800+01 | .104+00 | .800-02 | .156+01 |
| 3.4 | -4.783 | -2.497 | .903 | -1.383 | .165-04 | .318-02 | .800+01 | .414-01 | .318-02 | .157+01 |
| 3.8 | -5.582 | -2.897 | .903 | -1.782 | .262-05 | .127-02 | .800+01 | .165-01 | .127-02 | .157+01 |
| 4.2 | -6.382 | -3.297 | .903 | -2.182 | .414-06 | .505-03 | .800+01 | .657-02 | .505-03 | .157+01 |
| 4.6 | -7.182 | -3.697 | .903 | -2.582 | .657-07 | .201-03 | .800+01 | .262-02 | .201-03 | .157+01 |
| 5.0 | -7.982 | -4.097 | .903 | -2.982 | .104-07 | .800-04 | .800+01 | .104-02 | .800-04 | .157+01 |

EXACT ZIMM EIGENVALUES N= 8 H*= .130

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .135+00 | .303+01 | .330+00 | .130+02 | 1.759 | .569 | .618+02 | 1.1304 | .365 | 1.446 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .245 | -2.747 | -5.547 | -2.555 | .176+01 | .179-02 | .284-05 | .279-02 | .176+01 | .102-02 |
| -2.0 | .245 | -1.947 | -3.947 | -1.755 | .176+01 | .113-01 | .113-03 | .176-01 | .176+01 | .643-02 |
| -1.8 | .245 | -1.747 | -3.547 | -1.555 | .176+01 | .179-01 | .284-03 | .279-01 | .176+01 | .102-01 |
| -1.4 | .245 | -1.347 | -2.747 | -1.155 | .176+01 | .449-01 | .179-02 | .700-01 | .176+01 | .256-01 |
| -1.0 | .243 | -.951 | -1.951 | -.757 | .175+01 | .112+00 | .112-01 | .175+00 | .175+01 | .640-01 |
| -.8 | .239 | -.756 | -1.556 | -.561 | .173+01 | .175+00 | .278-01 | .275+00 | .174+01 | .101+00 |
| -.6 | .230 | -.570 | -1.170 | -.370 | .170+01 | .263+00 | .675-01 | .426+00 | .172+01 | .157+00 |
| -.4 | .209 | -.403 | -.803 | -.191 | .162+01 | .395+00 | .157+00 | .644+00 | .166+01 | .240+00 |
| -.2 | .165 | -.274 | -.474 | -.035 | .146+01 | .532+00 | .335+00 | .923+00 | .156+01 | .349+00 |
| .0 | .090 | -.206 | -.206 | .090 | .123+01 | .623+00 | .623+00 | .123+01 | .138+01 | .469+00 |
| .2 | -.009 | -.200 | .000 | .191 | .979+00 | .631 00 | .100+01 | .155+01 | .117+01 | .572+00 |
| .4 | -.117 | -.232 | .168 | .283 | .764+00 | .586+00 | .147+01 | .192+01 | .963+00 | .654+00 |
| .6 | -.232 | -.279 | .321 | .368 | .586+00 | .526+00 | .209+01 | .233+01 | .788+00 | .731+00 |
| .8 | -.362 | -.334 | .466 | .438 | .434+00 | .453+00 | .292+01 | .274+01 | .635+00 | .818+00 |
| 1.0 | -.519 | -.400 | .600 | .481 | .303+00 | .398+00 | .398+01 | .303+01 | .500+00 | .921+00 |
| 1.2 | -.718 | -.484 | .716 | .482 | .191+00 | .328+00 | .520+01 | .303+01 | .380+00 | .104+01 |
| 1.4 | -.975 | -.598 | .802 | .425 | .106+00 | .253+00 | .635+01 | .266+01 | .274+00 | .117+01 |
| 1.6 | -1.290 | -.745 | .855 | .310 | .513-01 | .180+00 | .717+01 | .204+01 | .187+00 | .129+01 |
| 1.8 | -1.647 | -.918 | .832 | .153 | .225-01 | .121+00 | .763+01 | .142+01 | .123+00 | .139+01 |
| 2.0 | -2.028 | -1.105 | .895 | -.028 | .937-02 | .784-01 | .784+01 | .937+00 | .790-01 | .145+01 |
| 2.2 | -2.421 | -1.300 | .900 | -.221 | .380-02 | .501-01 | .794+01 | .602+00 | .502-01 | .150+01 |
| 2.4 | -2.817 | -1.498 | .902 | -.417 | .152-02 | .317-01 | .797+01 | .382+00 | .318-01 | .152+01 |
| 2.6 | -3.216 | -1.597 | .903 | -.616 | .608-03 | .201-01 | .799+01 | .242+00 | .201-01 | .154+01 |
| 2.8 | -3.616 | -1.897 | .903 | -.816 | .242-03 | .127-01 | .800+01 | .153+00 | .127-01 | .155+01 |
| 3.0 | -4.015 | -2.097 | .903 | -1.015 | .965-04 | .800-02 | .800+01 | .965-01 | .800-02 | .156+01 |
| 3.4 | -4.815 | -2.497 | .903 | -1.415 | .153-04 | .318-02 | .800+01 | .384-01 | .318-02 | .157+01 |
| 3.8 | -5.615 | -2.897 | .903 | -1.815 | .242-05 | .127-02 | .800+01 | .153-01 | .127-02 | .157+01 |
| 4.2 | -6.415 | -3.297 | .903 | -2.215 | .384-06 | .505-03 | .800+01 | .609-02 | .505-03 | .157+01 |
| 4.6 | -7.215 | -3.697 | .903 | -2.615 | .609-07 | .201-03 | .800+01 | .242-02 | .201-03 | .157+01 |
| 5.0 | -8.015 | -4.097 | .903 | -3.015 | .965-08 | .800-04 | .800+01 | .965-03 | .800-04 | .157+01 |

EXACT ZIMM EIGENVALUES N= 8 H*= .150

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .137+00 | .290+01 | .345+00 | .130+02 | 1.786 | .560 | .602+02 | 1.1375 | .357 | 1.668 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .252 | -2.744 | -5.544 | -2.548 | .179+01 | .180-02 | .286-05 | .283-02 | .179+01 | .101-02 |
| -2.0 | .252 | -1.944 | -3.944 | -1.748 | .179+01 | .114-01 | .114-03 | .179-01 | .179+01 | .637-02 |
| -1.8 | .252 | -1.744 | -3.544 | -1.548 | .179+01 | .180-01 | .286-03 | .283-01 | .179+01 | .101-01 |
| -1.4 | .252 | -1.345 | -2.745 | -1.148 | .178+01 | .452-01 | .180-02 | .710-01 | .179+01 | .253-01 |
| -1.0 | .249 | -.948 | -1.948 | -.751 | .178+01 | .113+00 | .113-01 | .178+00 | .178+01 | .634-01 |
| -.8 | .246 | -.754 | -1.554 | -.554 | .176+01 | .176+00 | .280-01 | .279+00 | .177+01 | .998-01 |
| -.6 | .237 | -.568 | -1.168 | -.363 | .172+01 | .271+00 | .680-01 | .433+00 | .175+01 | .156+00 |
| -.4 | .216 | -.400 | -.800 | -.184 | .164+01 | .398+00 | .158+00 | .655+00 | .169+01 | .237+00 |
| -.2 | .173 | -.271 | -.471 | -.027 | .149+01 | .536+00 | .338+00 | .939+00 | .158+01 | .346+00 |
| .0 | .099 | -.201 | -.201 | .099 | .126+01 | .629+00 | .629+00 | .126+01 | .140+01 | .465+00 |
| .2 | .001 | -.194 | .006 | .201 | .100+01 | .640+00 | .101+01 | .159+01 | .119+01 | .568+00 |
| .4 | -.106 | -.224 | .176 | .294 | .783+00 | .597+00 | .150+01 | .197+01 | .985+00 | .652+00 |
| .6 | -.221 | -.268 | .332 | .379 | .601+00 | .539+00 | .215+01 | .239+01 | .807+00 | .731+00 |
| .8 | -.353 | -.322 | .478 | .447 | .444+00 | .477+00 | .301+01 | .280+01 | .651+00 | .821+00 |
| 1.0 | -.513 | -.387 | .613 | .487 | .307+00 | .410+00 | .410+01 | .307+01 | .512+00 | .929+00 |
| 1.2 | -.719 | -.473 | .727 | .481 | .191+00 | .337+00 | .533+01 | .303+01 | .387+00 | .105+01 |
| 1.4 | -.983 | -.590 | .810 | .417 | .104+00 | .257+00 | .646+01 | .261+01 | .277+00 | .119+01 |
| 1.6 | -1.305 | -.740 | .860 | .295 | .496-01 | .182+00 | .724+01 | .197+01 | .189+00 | .130+01 |
| 1.8 | -1.666 | -.916 | .884 | .134 | .216-01 | .121+00 | .766+01 | .136+01 | .123+00 | .140+01 |
| 2.0 | -2.049 | -1.105 | .895 | -.049 | .893-02 | .786-01 | .786+01 | .893+00 | .791-01 | .146+01 |
| 2.2 | -2.442 | -1.300 | .900 | -.242 | .361-02 | .501-01 | .794+01 | .572+00 | .502-01 | .150+01 |
| 2.4 | -2.840 | -1.498 | .902 | -.440 | .145-02 | .318-01 | .798+01 | .363+00 | .318-01 | .153+01 |
| 2.6 | -3.238 | -1.697 | .903 | -.638 | .578-03 | .201-01 | .799+01 | .230+00 | .201-01 | .154+01 |
| 2.8 | -3.638 | -1.897 | .903 | -.838 | .230-03 | .127-01 | .800+01 | .145+00 | .127-01 | .155+01 |
| 3.0 | -4.038 | -2.097 | .903 | -1.038 | .917-04 | .800-02 | .800+01 | .917-01 | .800-02 | .156+01 |
| 3.4 | -4.838 | -2.497 | .903 | -1.438 | .145-04 | .318-02 | .800+01 | .365-01 | .318-02 | .157+01 |
| 3.8 | -5.638 | -2.897 | .903 | -1.838 | .230-05 | .127-02 | .800+01 | .145-01 | .127-02 | .157+01 |
| 4.2 | -6.438 | -3.297 | .903 | -2.238 | .365-06 | .505-03 | .800+01 | .579-02 | .505-03 | .157+01 |
| 4.6 | -7.238 | -3.697 | .903 | -2.638 | .579-07 | .201-03 | .800+01 | .230-02 | .201-03 | .157+01 |
| 5.0 | -8.038 | -4.097 | .903 | -3.038 | .917-08 | .800-04 | .800+01 | .917-03 | .800-04 | .157+01 |

EXACT ZIMM EIGENVALUES N= 8 H*= .20

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .143+00 | .257+01 | .390+00 | .130+02 | 1.860 | .538 | .567+02 | 1.1572 | .334 | 2.228 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .270 | -2.737 | -5.537 | -2.530 | .186+01 | .183-02 | .291-05 | .295-02 | .186+01 | .986-03 |
| -2.0 | .270 | -1.937 | -3.937 | -1.730 | .186+01 | .116-01 | .116-03 | .186-01 | .186+01 | .622-02 |
| -1.8 | .270 | -1.737 | -3.537 | -1.530 | .186+01 | .183-01 | .291-03 | .295-01 | .186+01 | .986-02 |
| -1.4 | .259 | -1.337 | -2.737 | -1.131 | .186+01 | .460-01 | .183-02 | .740-01 | .186+01 | .247-01 |
| -1.0 | .267 | -.940 | -1.940 | -.733 | .185+01 | .115+00 | .115-01 | .185+00 | .185+01 | .619-01 |
| -.8 | .264 | -.746 | -1.546 | -.536 | .183+01 | .179+00 | .284-01 | .291+00 | .184+01 | .975-01 |
| -.6 | .255 | -.560 | -1.160 | -.345 | .180+01 | .276+00 | .692-01 | .452+00 | .182+01 | .152+00 |
| -.4 | .235 | -.392 | -.792 | -.165 | .172+01 | .406+00 | .161+00 | .684+00 | .176+01 | .232+00 |
| -.2 | .193 | -.261 | -.461 | -.007 | .156+01 | .548+00 | .346+00 | .985+00 | .165+01 | .338+00 |
| .0 | .122 | -.189 | -.189 | .122 | .133+01 | .647+00 | .647+00 | .137+01 | .147+01 | .454+00 |
| .2 | .028 | -.177 | .023 | .228 | .107+01 | .656+00 | .106+01 | .169+01 | .126+01 | .558+00 |
| .4 | -.078 | -.201 | .199 | .322 | .836+00 | .630+00 | .158+01 | .210+01 | .105+01 | .646+00 |
| .6 | -.194 | -.240 | .360 | .405 | .640+00 | .576+00 | .229+01 | .255+01 | .861+00 | .733+00 |
| .8 | -.330 | -.289 | .511 | .470 | .467+00 | .514+00 | .324+01 | .295+01 | .694+00 | .833+00 |
| 1.0 | -.502 | -.354 | .646 | .498 | .315+00 | .442+00 | .442+01 | .315+01 | .543+00 | .952+00 |
| 1.2 | -.724 | -.446 | .754 | .476 | .189+00 | .358+00 | .568+01 | .299+01 | .405+00 | .109+01 |
| 1.4 | -1.009 | -.572 | .828 | .391 | .980-01 | .268+00 | .674+01 | .246+01 | .285+00 | .122+01 |
| 1.6 | -1.346 | -.731 | .869 | .254 | .451-01 | .186+00 | .740+01 | .180+01 | .191+00 | .133+01 |
| 1.8 | -1.717 | -.911 | .889 | .083 | .192-01 | .123+00 | .774+01 | .121+01 | .124+00 | .142+01 |
| 2.0 | -2.104 | -1.103 | .897 | -.104 | .787-02 | .789-01 | .789+01 | .787+00 | .793-01 | .147+01 |
| 2.2 | -2.499 | -1.299 | .901 | -.299 | .317-02 | .502-01 | .796+01 | .503+00 | .503-01 | .151+01 |
| 2.4 | -2.897 | -1.498 | .902 | -.497 | .127[illegible] | .318-01 | .798+01 | .319+00 | .318-01 | .153+01 |
| 2.6 | -3.296 | -1.697 | .903 | -.696 | .506-03 | .201-01 | .799+01 | .201+00 | .201-01 | .155+01 |
| 2.8 | -3.696 | -1.897 | .903 | -.896 | .202-03 | .127-01 | .800+01 | .127+00 | .127-01 | .155+01 |
| 3.0 | -4.095 | -2.097 | .903 | -1.095 | .803-04 | .800-02 | .800+01 | .803-01 | .800-02 | .156+01 |
| 3.4 | -4.895 | -2.497 | .903 | -1.495 | .127-04 | .318-02 | .800+01 | .320-01 | .318-02 | .157+01 |
| 3.8 | -5.695 | -2.897 | .903 | -1.895 | .202-05 | .127-02 | .800+01 | .127-01 | .127-02 | .157+01 |
| 4.2 | -6.495 | -3.297 | .903 | -2.295 | .320-06 | .505-03 | .800+01 | .507-02 | .505-03 | .157+01 |
| 4.6 | -7.295 | -3.697 | .903 | -2.695 | .507-07 | .201-03 | .800+01 | .202-02 | .201-03 | .157+01 |
| 5.0 | -8.095 | -4.097 | .903 | -3.095 | .803-08 | .800-04 | .800+01 | .803-03 | .800-04 | .157+01 |

EXACT ZIMM EIGENVALUES N= 8 H*= .250

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JFR | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .148+00 | .224+01 | .447+00 | .131+02 | 1.946 | .514 | .538+02 | 1.1807 | .312 | 2.810 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .289 | -2.728 | -5.528 | -2.511 | .195+01 | .187-02 | .297-05 | .308-02 | .195+01 | .962-03 |
| -2.0 | .289 | -1.928 | -3.928 | -1.711 | .195+01 | .118-01 | .113-03 | .195-01 | .195+01 | .607-02 |
| -1.8 | .289 | -1.728 | -3.528 | -1.511 | .195+01 | .187-01 | .297-03 | .308-01 | .195+01 | .961-02 |
| -1.4 | .289 | -1.328 | -2.728 | -1.111 | .194+01 | .469-01 | .187-02 | .774-01 | .195+01 | .241-01 |
| -1.0 | .287 | -.932 | -1.932 | -.713 | .194+01 | .117+00 | .117-01 | .194+00 | .194+01 | .604-01 |
| -.8 | .283 | -.737 | -1.537 | -.517 | .192+01 | .183+00 | .290-01 | .304+00 | .193+01 | .951-01 |
| -.6 | .275 | -.551 | -1.151 | -.325 | .188+01 | .281+00 | .707-01 | .473+00 | .190+01 | .148+00 |
| -.4 | .256 | -.382 | -.782 | -.144 | .180+01 | .415+00 | .165+00 | .718+00 | .185+01 | .226+00 |
| -.2 | .216 | -.250 | -.450 | .016 | .164+01 | .562+00 | .355+00 | .104+01 | .174+01 | .329+00 |
| .0 | .148 | -.175 | -.175 | .148 | .140+01 | .669+00 | .669+00 | .140+01 | .156+01 | .444+00 |
| .2 | .056 | -.157 | .043 | .256 | .114+01 | .696+00 | .110+01 | .180+01 | .133+01 | .549+00 |
| .4 | -.048 | -.175 | .225 | .352 | .896+00 | .658+00 | .168+01 | .225+01 | .112+01 | .641+00 |
| .6 | -.165 | -.208 | .392 | .435 | .683+00 | .620+00 | .247+01 | .272+01 | .923+00 | .737+00 |
| .8 | -.309 | -.254 | .546 | .491 | .491+00 | .558+00 | .352+01 | .310+01 | .743+00 | .849+00 |
| 1.0 | -.494 | -.320 | .680 | .506 | .321+00 | .479+00 | .479+01 | .321+01 | .576+00 | .980+00 |
| 1.2 | -.737 | -.419 | .781 | .463 | .183+00 | .381+00 | .604+01 | .290+01 | .423+00 | .112+01 |
| 1.4 | -1.042 | -.555 | .845 | .358 | .908-01 | .278+00 | .699+01 | .228+01 | .293+00 | .126+01 |
| 1.6 | -1.393 | -.722 | .878 | .207 | .404-01 | .189+00 | .754+01 | .161+01 | .194+00 | .136+01 |
| 1.8 | -1.772 | -.907 | .893 | .028 | .169-01 | .124+00 | .781+01 | .107+01 | .125+00 | .143+01 |
| 2.0 | -2.162 | -1.101 | .899 | -.162 | .688-02 | .792-01 | .792+01 | .688+00 | .795-01 | .148+01 |
| 2.2 | -2.559 | -1.299 | .901 | -.359 | .276-02 | .503-01 | .797+01 | .438+00 | .504-01 | .152+01 |
| 2.4 | -2.957 | -1.498 | .902 | -.557 | .110-02 | .318-01 | .799+01 | .277+00 | .318-01 | .154+01 |
| 2.6 | -3.357 | -1.697 | .903 | -.757 | .440-03 | .201-01 | .799+01 | .175+00 | .201-01 | .155+01 |
| 2.8 | -3.756 | -1.897 | .903 | -.956 | .175-03 | .127-01 | .800+01 | .111+00 | .127-01 | .156+01 |
| 3.0 | -4.156 | -2.097 | .903 | -1.156 | .698-04 | .800-02 | .800+01 | .698-01 | .800-02 | .156+01 |
| 3.4 | -4.956 | -2.497 | .903 | -1.556 | .111-04 | .318-02 | .800+01 | .278-01 | .318-02 | .157+01 |
| 3.8 | -5.756 | -2.897 | .903 | -1.956 | .175-05 | .127-02 | .800+01 | .111-01 | .127-02 | .157+01 |
| 4.2 | -6.556 | -3.297 | .903 | -2.356 | .278-06 | .505-03 | .800+01 | .440-02 | .505-03 | .157+01 |
| 4.6 | -7.356 | -3.697 | .903 | -2.756 | .440-07 | .201-03 | .800+01 | .175-02 | .201-03 | .157+01 |
| 5.0 | -8.156 | -4.097 | .903 | -3.156 | .698-08 | .800-04 | .800+01 | .698-03 | .800-04 | .157+01 |

#1250

EXACT ZIMM EIGENVALUES N= 8 H*= .262

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JFR | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .149+00 | .216+01 | .463+00 | .132+02 | 1.969 | .508 | .532+02 | 1.1871 | .306 | 2.954 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .294 | -2.726 | -5.526 | -2.506 | .197+01 | .188-02 | .298-05 | .312-02 | .197+01 | .956-03 |
| -2.0 | .294 | -1.926 | -3.926 | -1.706 | .197+01 | .119-01 | .119-03 | .197-01 | .197+01 | .603-02 |
| -1.8 | .294 | -1.726 | -3.526 | -1.506 | .197+01 | .188-01 | .298-03 | .312-01 | .197+01 | .955-02 |
| -1.4 | .294 | -1.326 | -2.726 | -1.106 | .197+01 | .472-01 | .188-02 | .783-01 | .197+01 | .240-01 |
| -1.0 | .292 | -.929 | -1.929 | -.708 | .196+01 | .118+00 | .118-01 | .196+00 | .196+01 | .600-01 |
| -.8 | .289 | -.735 | -1.535 | -.511 | .194+01 | .184+00 | .292-01 | .308+00 | .195+01 | .945-01 |
| -.6 | .280 | -.548 | -1.148 | -.320 | .191+01 | .283+00 | .711-01 | .479+00 | .193+01 | .147+00 |
| -.4 | .261 | -.380 | -.780 | -.139 | .182+01 | .417+00 | .166+00 | .726+00 | .187+01 | .225+00 |
| -.2 | .222 | -.247 | -.447 | .022 | .167+01 | .566+00 | .357+00 | .105+01 | .176+01 | .327+00 |
| .0 | .154 | -.171 | -.171 | .154 | .143+01 | .675+00 | .675+00 | .143+01 | .158+01 | .442+00 |
| .2 | .063 | -.152 | .048 | .263 | .116+01 | .704+00 | .112+01 | .183+01 | .135+01 | .547+00 |
| .4 | -.040 | -.168 | .232 | .360 | .912+00 | .679+00 | .171+01 | .229+01 | .114+01 | .640+00 |
| .6 | -.158 | -.199 | .401 | .442 | .695+00 | .632+00 | .252+01 | .277+01 | .939+00 | .738+00 |
| .8 | -.304 | -.244 | .556 | .496 | .497+00 | .570+00 | .359+01 | .314+01 | .756+00 | .853+00 |
| 1.0 | -.493 | -.312 | .638 | .507 | .322+00 | .488+00 | .488+01 | .327+01 | .584+00 | .986+00 |
| 1.2 | -.741 | -.413 | .787 | .459 | .181+00 | .387+00 | .613+01 | .288+01 | .427+00 | .113+01 |
| 1.4 | -1.051 | -.552 | .848 | .349 | .889-01 | .281+00 | .705+01 | .223+01 | .294+00 | .126+01 |
| 1.6 | -1.406 | -.721 | .879 | .194 | .393-01 | .190+00 | .757+01 | .156+01 | .194+00 | .137+01 |
| 1.8 | -1.785 | -.907 | .893 | .015 | .164-01 | .124+00 | .782+01 | .103+01 | .125+00 | .144+01 |
| 2.0 | -2.177 | -1.101 | .899 | -.177 | .665-02 | .793-01 | .793+01 | .665+00 | .795-01 | .149+01 |
| 2.2 | -2.574 | -1.299 | .901 | -.374 | .267-02 | .503-01 | .797+01 | .423+00 | .504-01 | .152+01 |
| 2.4 | -2.972 | -1.498 | .902 | -.572 | .107-02 | .318-01 | .799+01 | .268+00 | .318-01 | .154+01 |
| 2.6 | -3.372 | -1.697 | .903 | -.772 | .425-03 | .201-01 | .800+01 | .169+00 | .201-01 | .155+01 |
| 2.8 | -3.771 | -1.897 | .903 | -.971 | .169-03 | .127-01 | .800+01 | .107+00 | .127-01 | .156+01 |
| 3.0 | -4.171 | -2.097 | .903 | -1.171 | .674-04 | .800-02 | .800+01 | .674-01 | .800-02 | .156+01 |
| 3.4 | -4.971 | -2.497 | .903 | -1.571 | .107-04 | .318-02 | .800+01 | .268-01 | .318-02 | .157+01 |
| 3.8 | -5.771 | -2.897 | .903 | -1.971 | .169-05 | .127-02 | .800+01 | .107-01 | .127-02 | .157+01 |
| 4.2 | -6.571 | -3.297 | .903 | -2.371 | .268-06 | .505-03 | .800+01 | .425-02 | .505-03 | .157+01 |
| 4.6 | -7.371 | -3.697 | .903 | -2.771 | .425-07 | .201-03 | .800+01 | .169-02 | .201-03 | .157+01 |
| 5.0 | -8.171 | -4.097 | .903 | -3.171 | .674-08 | .800-04 | .800+01 | .674-03 | .800-04 | .157+01 |

EXACT ZIMM EIGENVALUES N= 25 H*= .050

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JFR | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .178-01 | .364+01 | .274+00 | .981+02 | 1.742 | .574 | .349+04 | 1.1013 | .363 | .760 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1P | LOG G2R | ETA1P | ETA2P | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .241 | -2.758 | -5.558 | -2.559 | .174+01 | .175-02 | .277-05 | .276-02 | .174+01 | .100-02 |
| -2.0 | .241 | -1.958 | -3.958 | -1.759 | .174+01 | .110-01 | .110-03 | .174-01 | .174+01 | .632-02 |
| -1.8 | .241 | -1.758 | -3.558 | -1.559 | .174+01 | .175-01 | .277-03 | .276-01 | .174+01 | .100-01 |
| -1.4 | .241 | -1.359 | -2.759 | -1.159 | .174+01 | .438-01 | .174-02 | .693-01 | .174+01 | .252-01 |
| -1.0 | .238 | -.962 | -1.962 | -.762 | .173+01 | .109+00 | .109-01 | .173+00 | .174+01 | .629-01 |
| -.8 | .235 | -.768 | -1.568 | -.565 | .172+01 | .171+00 | .270-01 | .272+00 | .173+01 | .991-01 |
| -.6 | .226 | -.582 | -1.182 | -.374 | .168+01 | .262+00 | .657-01 | .427+00 | .170+01 | .154+00 |
| -.4 | .205 | -.416 | -.816 | -.195 | .160+01 | .384+00 | .153+00 | .638+00 | .165+01 | .235+00 |
| -.2 | .161 | -.289 | -.489 | -.039 | .145+01 | .514+00 | .324+00 | .914+00 | .154+01 | .341+00 |
| .0 | .087 | -.225 | -.225 | .087 | .122+01 | .596+00 | .596+00 | .122+01 | .136+01 | .454+00 |
| .2 | -.010 | -.227 | -.027 | .190 | .978+00 | .593+00 | .939+00 | .155+01 | .114+01 | .545+00 |
| .4 | -.109 | -.271 | .129 | .291 | .777+00 | .535+00 | .134+01 | .195+01 | .944+00 | .603+00 |
| .6 | -.207 | -.331 | .259 | .393 | .620+00 | .467+00 | .186+01 | .247+01 | .776+00 | .645+00 |
| .8 | -.307 | -.398 | .402 | .493 | .493+00 | .400+00 | .253+01 | .311+01 | .635+00 | .682+00 |
| 1.0 | -.409 | -.470 | .530 | .591 | .390+00 | .339+00 | .339+01 | .390+01 | .517+00 | .715+00 |
| 1.2 | -.514 | -.545 | .655 | .686 | .306+00 | .295+00 | .452+01 | .485+01 | .418+00 | .750+00 |
| 1.4 | -.625 | -.622 | .778 | .775 | .237+00 | .239+00 | .600+01 | .596+01 | .337+00 | .789+00 |
| 1.6 | -.744 | -.699 | .901 | .856 | .180+00 | .200+00 | .797+01 | .717+01 | .269+00 | .838+00 |
| 1.8 | -.890 | -.777 | 1.023 | .920 | .132+00 | .167+00 | .105+02 | .832+01 | .213+00 | .903+00 |
| 2.0 | -1.044 | -.861 | 1.139 | .956 | .904-01 | .138+00 | .138+02 | .904+01 | .165+00 | .990+00 |
| 2.2 | -1.253 | -.959 | 1.241 | .947 | .559-01 | .110+00 | .174+02 | .885+01 | .123+00 | .110+01 |
| 2.4 | -1.521 | -1.085 | 1.315 | .679 | .301-01 | .822-01 | .207+02 | .757+01 | .876-01 | .122+01 |
| 2.6 | -1.846 | -1.241 | 1.359 | .754 | .143-01 | .575-01 | .229+02 | .568+01 | .592-01 | .133+01 |
| 2.8 | -2.209 | -1.419 | 1.381 | .591 | .618-02 | .381-01 | .241+02 | .390+01 | .386-01 | .141+01 |
| 3.0 | -2.593 | -1.609 | 1.391 | .407 | .255-02 | .246-01 | .246+02 | .255+01 | .247-01 | .147+01 |
| 3.4 | -3.384 | -2.003 | 1.397 | .016 | .413-03 | .993-02 | .249+02 | .104+01 | .994-02 | .153+01 |
| 3.8 | -4.182 | -2.402 | 1.398 | -.382 | .657-04 | .396-02 | .250+02 | .415+00 | .396-02 | .155+01 |
| 4.2 | -4.982 | -2.802 | 1.398 | -.782 | .104-04 | .158-02 | .250+02 | .165+00 | .158-02 | .156+01 |
| 4.6 | -5.782 | -3.202 | 1.398 | -1.182 | .165-05 | .628-03 | .250+02 | .657-01 | .628-03 | .157+01 |
| 5.0 | -6.582 | -3.602 | 1.398 | -1.582 | .262-06 | .250-03 | .250+02 | .262-01 | .250-03 | .157+01 |

EXACT ZIMM EIGENVALUES N= 25 H*= .075

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .193-01 | .347+01 | .288+00 | .927+02 | 1.791 | .558 | .297+04 | 1.1097 | .346 | 1.077 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .253 | -2.755 | -5.555 | -2.547 | .179+01 | .176-02 | .279-05 | .284-02 | .179+01 | .982-03 |
| -2.0 | .253 | -1.955 | -3.955 | -1.747 | .179+01 | .111-01 | .111-03 | .179-01 | .179+01 | .620-02 |
| -1.8 | .253 | -1.755 | -3.555 | -1.547 | .179+01 | .176-01 | .279-03 | .284-01 | .179+01 | .982-02 |
| -1.4 | .253 | -1.355 | -2.755 | -1.147 | .179+01 | .441-01 | .176-02 | .712-01 | .179+01 | .246-01 |
| -1.0 | .251 | -.959 | -1.959 | -.749 | .178+01 | .110+00 | .110-01 | .178+00 | .178+01 | .617-01 |
| -.8 | .247 | -.765 | -1.565 | -.553 | .177+01 | .172+00 | .273-01 | .280+00 | .177+01 | .971-01 |
| -.6 | .238 | -.579 | -1.179 | -.362 | .173+01 | .264+00 | .662-01 | .435+00 | .175+01 | .151+00 |
| -.4 | .218 | -.412 | -.812 | -.182 | .165+01 | .387+00 | .154+00 | .657+00 | .170+01 | .230+00 |
| -.2 | .175 | -.285 | -.485 | -.025 | .150+01 | .519+00 | .327+00 | .944+00 | .158+01 | .334+00 |
| .0 | .103 | -.219 | -.219 | .103 | .127+01 | .604+00 | .604+00 | .127+01 | .140+01 | .444+00 |
| .2 | .010 | -.219 | -.019 | .210 | .102+01 | .603+00 | .956+00 | .162+01 | .119+01 | .533+00 |
| .4 | -.088 | -.260 | .140 | .312 | .817+00 | .549+00 | .138+01 | .205+01 | .985+00 | .591+00 |
| .6 | -.184 | -.317 | .283 | .416 | .655+00 | .482+00 | .192+01 | .261+01 | .813+00 | .635+00 |
| .8 | -.282 | -.381 | .419 | .518 | .523+00 | .416+00 | .263+01 | .330+01 | .668+00 | .673+00 |
| 1.0 | -.383 | -.450 | .550 | .617 | .414+00 | .355+00 | .355+01 | .414+01 | .546+00 | .708+00 |
| 1.2 | -.488 | -.522 | .678 | .712 | .325+00 | .301+00 | .476+01 | .516+01 | .443+00 | .746+00 |
| 1.4 | -.599 | -.596 | .804 | .801 | .252+00 | .254+00 | .637+01 | .632+01 | .357+00 | .789+00 |
| 1.6 | -.722 | -.670 | .930 | .878 | .190+00 | .214+00 | .850+01 | .755+01 | .286+00 | .844+00 |
| 1.8 | -.863 | -.747 | 1.053 | .937 | .137+00 | .179+00 | .113+02 | .864+01 | .225+00 | .918+00 |
| 2.0 | -1.038 | -.832 | 1.158 | .962 | .916-01 | .147+00 | .147+02 | .916+01 | .173+00 | .101+01 |
| 2.2 | -1.263 | -.936 | 1.264 | .937 | .546-01 | .116+00 | .183+02 | .866+01 | .128+00 | .113+01 |
| 2.4 | -1.548 | -1.070 | 1.330 | .852 | .283-01 | .851-01 | .214+02 | .711+01 | .897-01 | .125+01 |
| 2.6 | -1.886 | -1.233 | 1.367 | .714 | .130-01 | .585-01 | .233+02 | .518+01 | .599-01 | .135+01 |
| 2.8 | -2.257 | -1.415 | 1.385 | .543 | .554-02 | .385-01 | .243+02 | .349+01 | .389-01 | .143+01 |
| 3.0 | -2.644 | -1.607 | 1.393 | .356 | .227-02 | .247-01 | .247+02 | .227+01 | .248-01 | .148+01 |
| 3.4 | -3.437 | -2.003 | 1.397 | -.037 | .365-03 | .993-02 | .250+02 | .918+00 | .994-02 | .153+01 |
| 3.8 | -4.236 | -2.402 | 1.398 | -.436 | .581-04 | .396-02 | .250+02 | .366+00 | .396-02 | .156+01 |
| 4.2 | -5.036 | -2.802 | 1.398 | -.836 | .921-05 | .158-02 | .250+02 | .146+00 | .158-02 | .156+01 |
| 4.6 | -5.836 | -3.202 | 1.398 | -1.236 | .146-05 | .628-03 | .250+02 | .581-01 | .628-03 | .157+01 |
| 5.0 | -6.636 | -3.602 | 1.398 | -1.636 | .231-06 | .250-03 | .250+02 | .231-01 | .250-03 | .157+01 |

EXACT ZIMM EIGENVALUES N= 25 H*= .100

| L1 | LN | 1/(LN) | SUM 1/(LP) 1/(LP) | SUM L1/LP L1/LP | RECIP ROCAL ROCAL | SUM (1/LP)2 (1/LP)2 | SUM(L1 /LP)2 /LP)2 | JER | PHI -23 -23 |
|---|---|---|---|---|---|---|---|---|---|
| .209-01 | .330+01 | .303+00 | .881+02 | 1.840 | .543 | .256+04 | 1.1177 | .330 | 1.364 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .265 | -2.752 | -5.552 | -2.535 | .184+01 | .177-02 | .281-05 | .292-02 | .184+01 | .963-03 |
| -2.0 | .265 | -1.952 | -3.952 | -1.735 | .184+01 | .112-01 | .112-03 | .184-01 | .184+01 | .607-02 |
| -1.8 | .265 | -1.752 | -3.552 | -1.535 | .184+01 | .177-01 | .281-03 | .292-01 | .184+01 | .963-02 |
| -1.4 | .264 | -1.352 | -2.752 | -1.136 | .184+01 | .444-01 | .177-02 | .732-01 | .184+01 | .242-01 |
| -1.0 | .262 | -.956 | -1.956 | -.738 | .183+01 | .111+00 | .111-01 | .183+00 | .183+01 | .605-01 |
| -.8 | .259 | -.761 | -1.561 | -.541 | .181+01 | .173+00 | .275-01 | .288+00 | .182+01 | .952-01 |
| -.6 | .250 | -.576 | -1.176 | -.350 | .178+01 | .266+00 | .667-01 | .447+00 | .180+01 | .148+00 |
| -.4 | .230 | -.409 | -.809 | -.170 | .170+01 | .390+00 | .155+00 | .676+00 | .174+01 | .226+00 |
| -.2 | .189 | -.281 | -.481 | -.011 | .154+01 | .524+00 | .330+00 | .975+00 | .163+01 | .327+00 |
| .0 | .119 | -.214 | -.214 | .119 | .131+01 | .611+00 | .611+00 | .131+01 | .145+01 | .435+00 |
| .2 | .028 | -.212 | -.012 | .228 | .107+01 | .614+00 | .973+00 | .169+01 | .123+01 | .522+00 |
| .4 | -.067 | -.250 | .150 | .333 | .858+00 | .562+00 | .141+01 | .215+01 | .103+01 | .580+00 |
| .6 | -.161 | -.303 | .297 | .439 | .690+00 | .497+00 | .198+01 | .275+01 | .851+00 | .624+00 |
| .8 | -.258 | -.364 | .436 | .542 | .552+00 | .432+00 | .273+01 | .349+01 | .701+00 | .664+00 |
| 1.0 | -.358 | -.431 | .569 | .642 | .439+00 | .371+00 | .371+01 | .439+01 | .575+00 | .702+00 |
| 1.2 | -.463 | -.500 | .700 | .737 | .345+00 | .316+00 | .501+01 | .546+01 | .468+00 | .743+00 |
| 1.4 | -.575 | -.571 | .829 | .825 | .266+00 | .269+00 | .675+01 | .668+01 | .378+00 | .791+00 |
| 1.6 | -.701 | -.643 | .957 | .899 | .199+00 | .228+00 | .906+01 | .792+01 | .302+00 | .852+00 |
| 1.8 | -.849 | -.719 | 1.031 | .951 | .141+00 | .191+00 | .121+02 | .893+01 | .238+00 | .934+00 |
| 2.0 | -1.035 | -.806 | 1.194 | .965 | .922-01 | .156+00 | .156+02 | .922+01 | .182+00 | .104+01 |
| 2.2 | -1.276 | -.916 | 1.284 | .924 | .529-01 | .121+00 | .192+02 | .839+01 | .132+00 | .116+01 |
| 2.4 | -1.578 | -1.058 | 1.342 | .822 | .264-01 | .875-01 | .220+02 | .664+01 | .915-01 | .128+01 |
| 2.6 | -1.927 | -1.227 | 1.373 | .673 | .118-01 | .593-01 | .236+02 | .471+01 | .605-01 | .137+01 |
| 2.8 | -2.304 | -1.412 | 1.388 | .496 | .497-02 | .387-01 | .244+02 | .314+01 | .390-01 | .144+01 |
| 3.0 | -2.694 | -1.606 | 1.394 | .306 | .202-02 | .248-01 | .248+02 | .202+01 | .248-01 | .149+01 |
| 3.4 | -3.488 | -2.003 | 1.397 | -.088 | .325-03 | .994-02 | .250+02 | .816+00 | .994-02 | .154+01 |
| 3.8 | -4.287 | -2.402 | 1.398 | -.487 | .516-04 | .396-02 | .250+02 | .326+00 | .396-02 | .156+01 |
| 4.2 | -5.087 | -2.802 | 1.398 | -.887 | .818-05 | .158-02 | .250+02 | .130+00 | .158-02 | .157+01 |
| 4.6 | -5.887 | -3.202 | 1.398 | -1.287 | .130-05 | .628-03 | .250+02 | .516-01 | .628-03 | .157+01 |
| 5.0 | -6.687 | -3.602 | 1.398 | -1.687 | .206-06 | .250-03 | .250+02 | .206-01 | .250-03 | .157+01 |



#1250

EXACT ZIMM EIGENVALUES N= 25 H*= .130

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JFR | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .228-01 | .310+01 | .323+00 | .835+02 | 1.899 | .527 | .218+04 | 1.1270 | .313 | 1.681 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .278 | -2.748 | -5.548 | -2.522 | .190+01 | .179-02 | .283-05 | .301-02 | .190+01 | .941-03 |
| -2.0 | .278 | -1.948 | -3.948 | -1.722 | .190+01 | .113-01 | .113-03 | .190-01 | .190+01 | .594-02 |
| -1.8 | .278 | -1.748 | -3.548 | -1.522 | .190+01 | .179-01 | .283-03 | .301-01 | .190+01 | .941-02 |
| -1.4 | .278 | -1.349 | -2.749 | -1.122 | .190+01 | .448-01 | .178-02 | .755-01 | .190+01 | .236-01 |
| -1.0 | .276 | -.952 | -1.952 | -.724 | .189+01 | .112+00 | .112-01 | .189+00 | .189+01 | .591-01 |
| -.8 | .273 | -.758 | -1.558 | -.527 | .187+01 | .175+00 | .277-01 | .297+00 | .188+01 | .930-01 |
| -.6 | .264 | -.572 | -1.172 | -.336 | .184+01 | .268+00 | .673-01 | .462+00 | .186+01 | .145+00 |
| -.4 | .245 | -.405 | -.805 | -.155 | .176+01 | .394+00 | .157+00 | .700+00 | .180+01 | .220+00 |
| -.2 | .205 | -.276 | -.476 | .005 | .160+01 | .529+00 | .334+00 | .101+01 | .169+01 | .319+00 |
| .0 | .137 | -.208 | -.208 | .137 | .137+01 | .620+00 | .620+00 | .137+01 | .150+01 | .424+00 |
| .2 | .049 | -.204 | -.004 | .249 | .112+01 | .626+00 | .992+00 | .178+01 | .128+01 | .510+00 |
| .4 | -.043 | -.238 | .162 | .357 | .906+00 | .578+00 | .145+01 | .228+01 | .107+01 | .567+00 |
| .6 | -.135 | -.288 | .312 | .465 | .733+00 | .515+00 | .205+01 | .292+01 | .896+00 | .612+00 |
| .8 | -.230 | -.346 | .454 | .570 | .589+00 | .451+00 | .285+01 | .372+01 | .742+00 | .653+00 |
| 1.0 | -.329 | -.408 | .592 | .671 | .469+00 | .391+00 | .391+01 | .469+01 | .610+00 | .694+00 |
| 1.2 | -.434 | -.474 | .726 | .766 | .368+00 | .336+00 | .532+01 | .584+01 | .498+00 | .739+00 |
| 1.4 | -.548 | -.541 | .859 | .852 | .283+00 | .288+00 | .723+01 | .711+01 | .404+00 | .794+00 |
| 1.6 | -.678 | -.610 | .990 | .922 | .210+00 | .245+00 | .977+01 | .835+01 | .323+00 | .864+00 |
| 1.8 | -.836 | -.686 | 1.114 | .964 | .146+00 | .206+00 | .130+02 | .921+01 | .253+00 | .955+00 |
| 2.0 | -1.037 | -.777 | 1.223 | .963 | .918-01 | .167+00 | .167+02 | .918+01 | .191+00 | .107+01 |
| 2.2 | -1.298 | -.895 | 1.305 | .902 | .504-01 | .127+00 | .202+02 | .799+01 | .137+00 | .119+01 |
| 2.4 | -1.616 | -1.046 | 1.354 | .784 | .242-01 | .900-01 | .226+02 | .608+01 | .932-01 | .131+01 |
| 2.6 | -1.976 | -1.221 | 1.379 | .624 | .106-01 | .601-01 | .239+02 | .421+01 | .610-01 | .140+01 |
| 2.8 | -2.359 | -1.410 | 1.390 | .441 | .438-02 | .389-01 | .246+02 | .276+01 | .392-01 | .146+01 |
| 3.0 | -2.751 | -1.605 | 1.395 | .249 | .177-02 | .248-01 | .248+02 | .177+01 | .249-01 | .150+01 |
| 3.4 | -3.547 | -2.003 | 1.397 | -.147 | .284-03 | .994-02 | .250+02 | .713+00 | .995-02 | .154+01 |
| 3.8 | -4.346 | -2.402 | 1.398 | -.546 | .450-04 | .396-02 | .250+02 | .284+00 | .396-02 | .156+01 |
| 4.2 | -5.146 | -2.802 | 1.398 | -.946 | .714-05 | .158-02 | .250+02 | .113+00 | .158-02 | .157+01 |
| 4.6 | -5.946 | -3.202 | 1.398 | -1.346 | .113-05 | .628-03 | .250+02 | .451-01 | .628-03 | .157+01 |
| 5.0 | -6.746 | -3.602 | 1.398 | -1.746 | .179-06 | .250-03 | .250+02 | .179-01 | .250-03 | .157+01 |

#1250

EXACT ZIMM EIGENVALUES N= 25 H*= .150

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIPROCAL | SUM (1/LP)2 | SUM(L1/LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .240-01 | .296+01 | .337+00 | .808+02 | 1.938 | .516 | .197+04 | 1.1331 | .302 | 1.877 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .287 | -2.746 | -5.546 | -2.513 | .194+01 | .180-02 | .235-05 | .307-02 | .194+01 | .927-03 |
| -2.0 | .287 | -1.946 | -3.946 | -1.717 | .194+01 | .113-01 | .113-03 | .194-01 | .194+01 | .585-02 |
| -1.8 | .287 | -1.746 | -3.546 | -1.513 | .194+01 | .180-01 | .285-03 | .307-01 | .194+01 | .927-02 |
| -1.4 | .287 | -1.346 | -2.746 | -1.113 | .194+01 | .450-01 | .179-02 | .771-01 | .194+01 | .233-01 |
| -1.0 | .285 | -.950 | -1.950 | -.715 | .193+01 | .112+00 | .112-01 | .193+00 | .193+01 | .582-01 |
| -.8 | .282 | -.755 | -1.555 | -.519 | .191+01 | .176+00 | .278-01 | .303+00 | .192+01 | .916-01 |
| -.6 | .273 | -.569 | -1.169 | -.327 | .188+01 | .270+00 | .677-01 | .471+00 | .190+01 | .143+00 |
| -.4 | .254 | -.402 | -.802 | -.146 | .180+01 | .396+00 | .158+00 | .715+00 | .184+01 | .217+00 |
| -.2 | .215 | -.273 | -.473 | .015 | .164+01 | .533+00 | .336+00 | .104+01 | .173+01 | .314+00 |
| .0 | .149 | -.204 | -.204 | .149 | .141+01 | .625+00 | .625+00 | .141+01 | .154+01 | .418+00 |
| .2 | .063 | -.198 | .002 | .263 | .116+01 | .634+00 | .100+01 | .183+01 | .132+01 | .501+00 |
| .4 | -.027 | -.231 | .169 | .373 | .940+00 | .598+00 | .148+01 | .236+01 | .111+01 | .559+00 |
| .6 | -.118 | -.278 | .322 | .482 | .762+00 | .527+00 | .210+01 | .303+01 | .927+00 | .605+00 |
| .8 | -.212 | -.334 | .466 | .588 | .614+00 | .464+00 | .293+01 | .388+01 | .770+00 | .647+00 |
| 1.0 | -.310 | -.394 | .606 | .690 | .490+00 | .404+00 | .404+01 | .490+01 | .635+00 | .690+00 |
| 1.2 | -.415 | -.456 | .744 | .785 | .384+00 | .350+00 | .554+01 | .609+01 | .520+00 | .736+00 |
| 1.4 | -.531 | -.521 | .879 | .869 | .295+00 | .301+00 | .757+01 | .740+01 | .421+00 | .797+00 |
| 1.6 | -.665 | -.589 | 1.011 | .935 | .216+00 | .258+00 | .103+02 | .862+01 | .337+00 | .872+00 |
| 1.8 | -.829 | -.664 | 1.136 | .971 | .148+00 | .217+00 | .137+02 | .935+01 | .262+00 | .971+00 |
| 2.0 | -1.041 | -.759 | 1.241 | .959 | .909-01 | .174+00 | .174+02 | .909+01 | .197+00 | .109+01 |
| 2.2 | -1.314 | -.883 | 1.317 | .886 | .485-01 | .131+00 | .207+02 | .769+01 | .140+00 | .122+01 |
| 2.4 | -1.643 | -1.039 | 1.361 | .757 | .227-01 | .913-01 | .229+02 | .571+01 | .941-01 | .133+01 |
| 2.6 | -2.009 | -1.218 | 1.382 | .591 | .979-02 | .605-01 | .241+02 | .390+01 | .613-01 | .141+01 |
| 2.8 | -2.335 | -1.409 | 1.391 | .405 | .403-02 | .390-01 | .246+02 | .254+01 | .392-01 | .147+01 |
| 3.0 | -2.789 | -1.605 | 1.395 | .211 | .163-02 | .248-01 | .248+02 | .163+01 | .249-01 | .151+01 |
| 3.4 | -3.585 | -2.002 | 1.398 | -.185 | .260-03 | .994-02 | .250+02 | .653+00 | .995-02 | .154+01 |
| 3.8 | -4.385 | -2.402 | 1.398 | -.585 | .412-04 | .396-02 | .250+02 | .260+00 | .396-02 | .156+01 |
| 4.2 | -5.185 | -2.802 | 1.398 | -.985 | .654-05 | .158-02 | .250+02 | .104+00 | .158-02 | .157+01 |
| 4.6 | -5.985 | -3.202 | 1.398 | -1.385 | .104-05 | .628-03 | .250+02 | .413-01 | .628-03 | .157+01 |
| 5.0 | -6.785 | -3.602 | 1.398 | -1.785 | .164-06 | .250-03 | .250+02 | .164-01 | .250-03 | .157+01 |



#1250

#1250

EXACT ZIMM EIGENVALUES N= 25 H*= .200

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIPROCAL | SUM (1/LP)2 | SUM(L1/LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .270-01 | .262+01 | .381+00 | .754+02 | 2.039 | .491 | .157+04 | 1.1478 | .276 | 2.335 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1P | ETA2R | G1R | G2R | MOD ETAP | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .309 | -2.740 | -5.540 | -2.491 | .204+01 | .182-02 | .288-05 | .323-02 | .204+01 | .892-03 |
| -2.0 | .309 | -1.940 | -3.940 | -1.691 | .204+01 | .115-01 | .115-03 | .204-01 | .204+01 | .563-02 |
| -1.8 | .309 | -1.740 | -3.540 | -1.491 | .204+01 | .182-01 | .288-03 | .323-01 | .204+01 | .892-02 |
| -1.4 | .309 | -1.341 | -2.741 | -1.091 | .204+01 | .456-01 | .182-02 | .811-01 | .204+01 | .224-01 |
| -1.0 | .307 | -.944 | -1.944 | -.693 | .203+01 | .114+00 | .114-01 | .203+00 | .203+01 | .560-01 |
| -.8 | .304 | -.750 | -1.550 | -.496 | .201+01 | .178+00 | .282-01 | .319+00 | .202+01 | .882-01 |
| -.6 | .296 | -.563 | -1.163 | -.304 | .198+01 | .273+00 | .686-01 | .497+00 | .200+01 | .137+00 |
| -.4 | .278 | -.396 | -.796 | -.127 | .190+01 | .402+00 | .150+00 | .755+00 | .194+01 | .209+00 |
| -.2 | .241 | -.266 | -.466 | .041 | .174+01 | .542+00 | .342+00 | .110+01 | .182+01 | .302+00 |
| .0 | .178 | -.195 | -.195 | .178 | .151+01 | .639+00 | .639+00 | .151+01 | .164+01 | .401+00 |
| .2 | .097 | -.185 | .015 | .297 | .125+01 | .653+00 | .104+01 | .198+01 | .141+01 | .482+00 |
| .4 | .011 | -.213 | .187 | .411 | .103+01 | .613+00 | .154+01 | .258+01 | .119+01 | .539+00 |
| .6 | -.076 | -.255 | .345 | .524 | .839+00 | .556+00 | .222+01 | .334+01 | .101+01 | .586+00 |
| .8 | -.167 | -.304 | .496 | .633 | .680+00 | .497+00 | .314+01 | .429+01 | .843+00 | .631+00 |
| 1.0 | -.264 | -.357 | .643 | .736 | .545+00 | .440+00 | .440+01 | .545+01 | .700+00 | .679+00 |
| 1.2 | -.370 | -.413 | .787 | .830 | .427+00 | .387+00 | .613+01 | .677+01 | .576+00 | .736+00 |
| 1.4 | -.490 | -.471 | .929 | .910 | .324+00 | .338+00 | .849+01 | .813+01 | .468+00 | .807+00 |
| 1.6 | -.635 | -.535 | 1.065 | .965 | .232+00 | .292+00 | .116+02 | .924+01 | .373+00 | .899+00 |
| 1.8 | -.820 | -.614 | 1.186 | .980 | .152+00 | .243+00 | .154+02 | .956+01 | .287+00 | .101+01 |
| 2.0 | -1.062 | -.719 | 1.281 | .938 | .868-01 | .191+00 | .191+02 | .868+01 | .210+00 | .114+01 |
| 2.2 | -1.365 | -.859 | 1.341 | .835 | .432-01 | .138+00 | .219+02 | .684+01 | .145+00 | .127+01 |
| 2.4 | -1.715 | -1.027 | 1.373 | .685 | .193-01 | .940-01 | .236+02 | .484+01 | .960-01 | .137+01 |
| 2.6 | -2.093 | -1.212 | 1.388 | .507 | .807-02 | .613-01 | .244+02 | .321+01 | .619-01 | .144+01 |
| 2.8 | -2.484 | -1.406 | 1.394 | .316 | .328-02 | .392-01 | .248+02 | .207+01 | .394-01 | .149+01 |
| 3.0 | -2.880 | -1.604 | 1.396 | .120 | .132-02 | .249-01 | .249+02 | .132+01 | .249-01 | .152+01 |
| 3.4 | -3.678 | -2.002 | 1.398 | -.278 | .210-03 | .995-02 | .250+02 | .527+00 | .995-02 | .155+01 |
| 3.8 | -4.478 | -2.402 | 1.398 | -.678 | .333-04 | .396-02 | .250+02 | .210+00 | .396-02 | .156+01 |
| 4.2 | -5.277 | -2.802 | 1.398 | -1.077 | .528-05 | .158-02 | .250+02 | .837-01 | .158-02 | .157+01 |
| 4.6 | -6.077 | -3.202 | 1.398 | -1.477 | .837-06 | .628-03 | .250+02 | .333-01 | .628-03 | .157+01 |
| 5.0 | -6.877 | -3.602 | 1.398 | -1.877 | .133-06 | .250-03 | .250+02 | .133-01 | .250-03 | .157+01 |

EXACT ZIMM EIGENVALUES

N= 25 H*= 250

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .301-01 | .228+01 | .438+00 | .714+02 | 2.146 | .466 | .129+04 | 1.1624 | .253 | 2.764 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1P | LOG G2P | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .332 | -2.735 | -5.535 | -2.468 | .215+01 | .184-02 | .292-05 | .340-02 | .215+01 | .859-03 |
| -2.0 | .332 | -1.935 | -3.935 | -1.668 | .215+01 | .116-01 | .116-03 | .215-01 | .215+01 | .542-02 |
| -1.8 | .331 | -1.735 | -3.535 | -1.469 | .215+01 | .184-01 | .292-03 | .340-01 | .215+01 | .859-02 |
| -1.4 | .331 | -1.335 | -2.735 | -1.069 | .214+01 | .462-01 | .184-02 | .853-01 | .214+01 | .216-01 |
| -1.0 | .329 | -.938 | -1.938 | -.671 | .214+01 | .115+00 | .115-01 | .214+00 | .214+01 | .539-01 |
| -.8 | .326 | -.744 | -1.544 | -.474 | .212+01 | .180+00 | .286-01 | .336+00 | .213+01 | .848-01 |
| -.6 | .319 | -.558 | -1.158 | -.281 | .208+01 | .277+00 | .696-01 | .523+00 | .210+01 | .132+00 |
| -.4 | .302 | -.390 | -.790 | -.098 | .200+01 | .408+00 | .162+00 | .797+00 | .204+01 | .201+00 |
| -.2 | .266 | -.253 | -.459 | .066 | .185+01 | .551+00 | .348+00 | .116+01 | .193+01 | .290+00 |
| .0 | .207 | -.186 | -.186 | .207 | .161+01 | .652+00 | .652+00 | .161+01 | .174+01 | .385+00 |
| .2 | .130 | -.172 | .028 | .330 | .135+01 | .672+00 | .107+01 | .214+01 | .151+01 | .462+00 |
| .4 | .049 | -.195 | .205 | .449 | .112+01 | .638+00 | .160+01 | .281+01 | .129+01 | .519+00 |
| .6 | -.035 | -.231 | .369 | .565 | .923+00 | .537+00 | .234+01 | .367+01 | .109+01 | .567+00 |
| .8 | -.123 | -.273 | .527 | .677 | .754+00 | .533+00 | .336+01 | .476+01 | .923+00 | .616+00 |
| 1.0 | -.218 | -.319 | .681 | .782 | .605+00 | .480+00 | .480+01 | .605+01 | .772+00 | .670+00 |
| 1.2 | -.325 | -.367 | .833 | .875 | .473+00 | .429+00 | .681+01 | .749+01 | .639+00 | .737+00 |
| 1.4 | -.452 | -.419 | .981 | .948 | .353+00 | .381+00 | .957+01 | .837+01 | .519+00 | .823+00 |
| 1.6 | -.612 | -.402 | 1.118 | .988 | .244+00 | .330+00 | .131+02 | .973+01 | .410+00 | .933+00 |
| 1.8 | -.823 | -.567 | 1.233 | .977 | .150+00 | .271+00 | .171+02 | .949+01 | .310+00 | .106+01 |
| 2.0 | -1.096 | -.687 | 1.313 | .904 | .802-01 | .206+00 | .206+02 | .802+01 | .221+00 | .120+01 |
| 2.2 | -1.426 | -.841 | 1.359 | .774 | .375-01 | .144+00 | .229+02 | .594+01 | .143+00 | .132+01 |
| 2.4 | -1.793 | -1.018 | 1.382 | .507 | .161-01 | .959-01 | .241+02 | .405+01 | .972-01 | .140+01 |
| 2.6 | -2.178 | -1.209 | 1.391 | .422 | .663-02 | .618-01 | .246+02 | .264+01 | .622-01 | .146+01 |
| 2.8 | -2.573 | -1.405 | 1.395 | .227 | .268-02 | .394-01 | .248+02 | .169+01 | .395-01 | .150+01 |
| 3.0 | -2.970 | -1.603 | 1.397 | .030 | .107-02 | .249-01 | .249+02 | .107+01 | .250-01 | .153+01 |
| 3.4 | -3.769 | -2.002 | 1.398 | -.369 | .170-03 | .995-02 | .250+02 | .428+00 | .995-02 | .155+01 |
| 3.8 | -4.569 | -2.402 | 1.398 | -.769 | .270-04 | .396-02 | .250+02 | .170+00 | .396-02 | .156+01 |
| 4.2 | -5.369 | -2.802 | 1.398 | -1.169 | .428-05 | .158-02 | .250+02 | .678-01 | .158-02 | .157+01 |
| 4.6 | -6.169 | -3.202 | 1.398 | -1.569 | .678-06 | .628-03 | .250+02 | .270-01 | .628-03 | .157+01 |
| 5.0 | -6.969 | -3.602 | 1.398 | -1.969 | .108-06 | .250-03 | .250+02 | .108-01 | .250-03 | .157+01 |



#1250

EXACT ZIMM EIGENVALUES N= 25 H*= .262

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JFR | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .308-01 | .220+01 | .454+00 | .706+02 | 2.173 | .460 | .123+04 | 1.1659 | .247 | 2.864 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .337 | -2.733 | -5.533 | -2.463 | .217+01 | .195-02 | .293-05 | .344-02 | .217+01 | .851-03 |
| -2.0 | .337 | -1.933 | -3.933 | -1.663 | .217+01 | .117-01 | .117-03 | .217-01 | .217+01 | .537-02 |
| -1.8 | .337 | -1.733 | -3.533 | -1.463 | .217+01 | .195-01 | .293-03 | .344-01 | .217+01 | .850-02 |
| -1.4 | .337 | -1.334 | -2.734 | -1.063 | .217+01 | .464-01 | .185-02 | .864-01 | .217+01 | .213-01 |
| -1.0 | .335 | -.937 | -1.937 | -.665 | .216+01 | .116+00 | .116-01 | .216+00 | .217+01 | .534-01 |
| -.8 | .332 | -.743 | -1.543 | -.463 | .215+01 | .191+00 | .287-01 | .340+00 | .215+01 | .840-01 |
| -.6 | .324 | -.556 | -1.156 | -.276 | .213+01 | .278+00 | .698-01 | .530+00 | .213+01 | .131+00 |
| -.4 | .307 | -.388 | -.788 | -.093 | .203+01 | .409+00 | .163+00 | .808+00 | .207+01 | .199+00 |
| -.2 | .272 | -.257 | -.457 | .072 | .187+01 | .553+00 | .349+00 | .118+01 | .195+01 | .287+00 |
| .0 | .214 | -.184 | -.184 | .214 | .164+01 | .655+00 | .655+00 | .164+01 | .176+01 | .381+00 |
| .2 | .138 | -.169 | .031 | .338 | .137+01 | .677+00 | .107+01 | .218+01 | .153+01 | .458+00 |
| .4 | .058 | -.191 | .209 | .458 | .114+01 | .645+00 | .162+01 | .287+01 | .131+01 | .514+00 |
| .6 | -.025 | -.225 | .375 | .575 | .945+00 | .595+00 | .237+01 | .376+01 | .112+01 | .562+00 |
| .8 | -.112 | -.266 | .534 | .688 | .773+00 | .542+00 | .342+01 | .487+01 | .944+00 | .612+00 |
| 1.0 | -.207 | -.309 | .691 | .793 | .621+00 | .490+00 | .490+01 | .621+01 | .791+00 | .669+00 |
| 1.2 | -.315 | -.356 | .844 | .885 | .485+00 | .441+00 | .699+01 | .768+01 | .655+00 | .738+00 |
| 1.4 | -.443 | -.406 | .994 | .957 | .360+00 | .392+00 | .985+01 | .905+01 | .533+00 | .828+00 |
| 1.6 | -.608 | -.469 | 1.131 | .992 | .247+00 | .340+00 | .135+02 | .982+01 | .420+00 | .942+00 |
| 1.8 | -.825 | -.557 | 1.243 | .975 | .150+00 | .276+00 | .175+02 | .943+01 | .315+00 | .108+01 |
| 2.0 | -1.106 | -.680 | 1.320 | .894 | .783-01 | .209+00 | .209+02 | .783+01 | .223+00 | .121+01 |
| 2.2 | -1.442 | -.837 | 1.363 | .758 | .361-01 | .146+00 | .231+02 | .573+01 | .150+00 | .133+01 |
| 2.4 | -1.812 | -1.017 | 1.383 | .588 | .154-01 | .962-01 | .242+02 | .387+01 | .974-01 | .141+01 |
| 2.6 | -2.199 | -1.208 | 1.392 | .401 | .632-02 | .619-01 | .247+02 | .252+01 | .623-01 | .147+01 |
| 2.8 | -2.594 | -1.404 | 1.396 | .206 | .255-02 | .394-01 | .249+02 | .161+01 | .395-01 | .151+01 |
| 3.0 | -2.992 | -1.603 | 1.397 | .008 | .102-02 | .249-01 | .249+02 | .102+01 | .250-01 | .153+01 |
| 3.4 | -3.791 | -2.002 | 1.398 | -.391 | .162-03 | .995-02 | .250+02 | .407+00 | .995-02 | .155+01 |
| 3.8 | -4.590 | -2.402 | 1.398 | -.790 | .257-04 | .396-02 | .250+02 | .162+00 | .396-02 | .156+01 |
| 4.2 | -5.390 | -2.802 | 1.398 | -1.190 | .407-05 | .158-02 | .250+02 | .645-01 | .158-02 | .157+01 |
| 4.6 | -6.190 | -3.202 | 1.398 | -1.590 | .645-06 | .628-03 | .250+02 | .257-01 | .628-03 | .157+01 |
| 5.0 | -6.990 | -3.602 | 1.398 | -1.990 | .102-06 | .250-03 | .250+02 | .102-01 | .250-03 | .157+01 |

EXACT ZIMM EIGENVALUES

N= 25 H*= .300

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .330-01 | .194+01 | .515+00 | .685+02 | 2.263 | .442 | .108+04 | 1.1773 | .230 | 3.183 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .355 | -2.729 | -5.529 | -2.445 | .226+01 | .187-02 | .296-05 | .359-02 | .226+01 | .824-03 |
| -2.0 | .355 | -1.929 | -3.929 | -1.645 | .226+01 | .118-01 | .118-03 | .226-01 | .226+01 | .520-02 |
| -1.8 | .355 | -1.729 | -3.529 | -1.445 | .226+01 | .197-01 | .296-03 | .359-01 | .226+01 | .824-02 |
| -1.4 | .354 | -1.330 | -2.730 | -1.046 | .226+01 | .468-01 | .186-02 | .900-01 | .226+01 | .207-01 |
| -1.0 | .353 | -.933 | -1.933 | -.647 | .225+01 | .117+00 | .117-01 | .225+00 | .226+01 | .516-01 |
| -.8 | .350 | -.738 | -1.538 | -.450 | .224+01 | .183+00 | .289-01 | .355+00 | .224+01 | .815-01 |
| -.6 | .343 | -.552 | -1.152 | -.257 | .220+01 | .281+00 | .705-01 | .553+00 | .222+01 | .127+00 |
| -.4 | .326 | -.384 | -.784 | -.074 | .212+01 | .413+00 | .165+00 | .844+00 | .216+01 | .193+00 |
| -.2 | .293 | -.252 | -.452 | .093 | .196+01 | .560+00 | .353+00 | .124+01 | .204+01 | .279+00 |
| .0 | .236 | -.177 | -.177 | .236 | .172+01 | .666+00 | .666+00 | .172+01 | .185+01 | .369+00 |
| .2 | .164 | -.160 | .040 | .364 | .146+01 | .692+00 | .110+01 | .231+01 | .162+01 | .443+00 |
| .4 | .087 | -.177 | .223 | .487 | .122+01 | .665+00 | .167+01 | .307+01 | .139+01 | .498+00 |
| .6 | .008 | -.207 | .393 | .608 | .102+01 | .622+00 | .247+01 | .405+01 | .119+01 | .548+00 |
| .8 | -.077 | -.241 | .559 | .723 | .837+00 | .574+00 | .362+01 | .528+01 | .102+01 | .601+00 |
| 1.0 | -.171 | -.278 | .722 | .829 | .674+00 | .527+00 | .527+01 | .674+01 | .856+00 | .664+00 |
| 1.2 | -.281 | -.318 | .882 | .919 | .523+00 | .481+00 | .763+01 | .829+01 | .711+00 | .744+00 |
| 1.4 | -.418 | -.364 | 1.036 | .982 | .382+00 | .432+00 | .109+02 | .959+01 | .577+00 | .847+00 |
| 1.6 | -.599 | -.429 | 1.171 | 1.001 | .252+00 | .373+00 | .148+02 | .100+02 | .450+00 | .976+00 |
| 1.8 | -.840 | -.525 | 1.275 | .960 | .145+00 | .298+00 | .188+02 | .912+01 | .331+00 | .112+01 |
| 2.0 | -1.145 | -.661 | 1.339 | .855 | .717-01 | .218+00 | .218+02 | .717+01 | .230+00 | .125+01 |
| 2.2 | -1.496 | -.823 | 1.372 | .704 | .319-01 | .149+00 | .236+02 | .505+01 | .152+00 | .136+01 |
| 2.4 | -1.875 | -1.013 | 1.387 | .525 | .133-01 | .971-01 | .244+02 | .335+01 | .980-01 | .143+01 |
| 2.6 | -2.266 | -1.206 | 1.394 | .334 | .542-02 | .622-01 | .248+02 | .216+01 | .624-01 | .148+01 |
| 2.8 | -2.662 | -1.404 | 1.396 | .138 | .218-02 | .395-01 | .249+02 | .137+01 | .395-01 | .152+01 |
| 3.0 | -3.061 | -1.603 | 1.397 | -.061 | .869-03 | .250-01 | .250+02 | .869+00 | .250-01 | .154+01 |
| 3.4 | -3.860 | -2.002 | 1.398 | -.460 | .138-03 | .995-02 | .250+02 | .347+00 | .995-02 | .156+01 |
| 3.8 | -4.660 | -2.402 | 1.398 | -.860 | .219-04 | .396-02 | .250+02 | .138+00 | .396-02 | .157+01 |
| 4.2 | -5.460 | -2.802 | 1.398 | -1.260 | .347-05 | .158-02 | .250+02 | .550-01 | .158-02 | .157+01 |
| 4.6 | -6.260 | -3.202 | 1.398 | -1.660 | .550-06 | .628-03 | .250+02 | .219-01 | .628-03 | .157+01 |
| 5.0 | -7.060 | -3.602 | 1.398 | -2.060 | .871-07 | .250-03 | .250+02 | .871-02 | .250-03 | .157+01 |



#1250

EXACT ZIMM EIGENVALUES N= 50 H*= .050

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JFR | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .525-02 | .365+01 | .274+00 | .339+03 | 1.780 | .562 | .400+05 | 1.1048 | .349 | .928 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .250 | -2.757 | -5.557 | -2.550 | .178+01 | .175-02 | .278-05 | .282-02 | .178+01 | .984-03 |
| -2.0 | .250 | -1.957 | -3.957 | -1.750 | .178+01 | .110-01 | .110-03 | .178-01 | .178+01 | .621-02 |
| -1.8 | .250 | -1.757 | -3.557 | -1.550 | .178+01 | .175-01 | .277-03 | .282-01 | .178+01 | .984-02 |
| -1.4 | .250 | -1.357 | -2.757 | -1.150 | .178+01 | .439-01 | .175-02 | .708-01 | .178+01 | .247-01 |
| -1.0 | .248 | -.961 | -1.961 | -.752 | .177+01 | .109+00 | .109-01 | .177+00 | .177+01 | .618-01 |
| -.8 | .244 | -.767 | -1.567 | -.556 | .175+01 | .171+00 | .271-01 | .278+00 | .176+01 | .972-01 |
| -.6 | .235 | -.581 | -1.181 | -.365 | .172+01 | .263+00 | .659-01 | .432+00 | .174+01 | .152+00 |
| -.4 | .215 | -.415 | -.815 | -.185 | .164+01 | .385+00 | .153+00 | .653+00 | .168+01 | .231+00 |
| -.2 | .172 | -.287 | -.487 | -.028 | .149+01 | .516+00 | .326+00 | .938+00 | .157+01 | .334+00 |
| .0 | .100 | -.222 | -.222 | .100 | .126+01 | .599+00 | .599+00 | .126+01 | .139+01 | .445+00 |
| .2 | .006 | -.224 | -.024 | .206 | .101+01 | .597+00 | .946+00 | .161+01 | .118+01 | .532+00 |
| .4 | -.091 | -.267 | .133 | .309 | .811+00 | .541+00 | .136+01 | .204+01 | .975+00 | .588+00 |
| .6 | -.186 | -.326 | .274 | .414 | .652+00 | .472+00 | .188+01 | .259+01 | .805+00 | .627+00 |
| .8 | -.282 | -.393 | .407 | .518 | .523+00 | .405+00 | .255+01 | .330+01 | .661+00 | .659+00 |
| 1.0 | -.379 | -.466 | .534 | .621 | .418+00 | .342+00 | .342+01 | .418+01 | .540+00 | .685+00 |
| 1.2 | -.477 | -.544 | .656 | .723 | .333+00 | .286+00 | .453+01 | .528+01 | .439+00 | .709+00 |
| 1.4 | -.577 | -.624 | .776 | .823 | .265+00 | .238+00 | .597+01 | .665+01 | .356+00 | .732+00 |
| 1.6 | -.680 | -.706 | .894 | .920 | .209+00 | .197+00 | .783+01 | .832+01 | .287+00 | .756+00 |
| 1.8 | -.787 | -.788 | 1.012 | 1.013 | .163+00 | .163+00 | .103+02 | .103+02 | .231+00 | .784+00 |
| 2.0 | -.899 | -.870 | 1.130 | 1.101 | .126+00 | .135+00 | .135+02 | .126+02 | .185+00 | .820+00 |
| 2.2 | -1.023 | -.950 | 1.250 | 1.177 | .948-01 | .112+00 | .178+02 | .150+02 | .147+00 | .869+00 |
| 2.4 | -1.166 | -1.032 | 1.368 | 1.234 | .682-01 | .929-01 | .233+02 | .171+02 | .115+00 | .938+00 |
| 2.6 | -1.343 | -1.121 | 1.479 | 1.257 | .454-01 | .757-01 | .301+02 | .181+02 | .882-01 | .103+01 |
| 2.8 | -1.571 | -1.229 | 1.571 | 1.229 | .268-01 | .591-01 | .373+02 | .169+02 | .649-01 | .114+01 |
| 3.0 | -1.860 | -1.365 | 1.635 | 1.140 | .138-01 | .431-01 | .431+02 | .138+02 | .453-01 | .126+01 |
| 3.4 | -2.572 | -1.713 | 1.687 | .828 | .268-02 | .194-01 | .486+02 | .673+01 | .195-01 | .143+01 |
| 3.8 | -3.355 | -2.103 | 1.697 | .445 | .441-03 | .789-02 | .498+02 | .278+01 | .790-02 | .151+01 |
| 4.2 | -4.153 | -2.501 | 1.699 | .047 | .703-04 | .315-02 | .500+02 | .111+01 | .315-02 | .155+01 |
| 4.6 | -4.952 | -2.901 | 1.699 | -.352 | .112-04 | .126-02 | .500+02 | .444+00 | .126-02 | .156+01 |
| 5.0 | -5.752 | -3.301 | 1.699 | -.752 | .177-05 | .500-03 | .500+02 | .177+00 | .500-03 | .157+01 |

EXACT ZIMM EIGENVALUES N= 50 H*= .075

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .598-02 | .348+01 | .287+00 | .308+03 | 1.840 | .543 | .312+05 | 1.1139 | .329 | 1.265 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .265 | -2.753 | -5.553 | -2.535 | .184+01 | .177-02 | .280-05 | .292-02 | .184+01 | .959-03 |
| -2.0 | .265 | -1.953 | -3.953 | -1.735 | .184+01 | .111-01 | .111-03 | .184-01 | .184+01 | .605-02 |
| -1.8 | .265 | -1.753 | -3.553 | -1.535 | .184+01 | .177-01 | .280-03 | .292-01 | .184+01 | .959-02 |
| -1.4 | .265 | -1.354 | -2.754 | -1.135 | .184+01 | .443-01 | .176-02 | .732-01 | .184+01 | .241-01 |
| -1.0 | .263 | -.957 | -1.957 | -.737 | .183+01 | .110+00 | .110-01 | .183+00 | .183+01 | .602-01 |
| -.8 | .259 | -.763 | -1.563 | -.541 | .182+01 | .173+00 | .274-01 | .288+00 | .182+01 | .948-01 |
| -.6 | .250 | -.577 | -1.177 | -.350 | .178+01 | .265+00 | .665-01 | .447+00 | .180+01 | .148+00 |
| -.4 | .230 | -.411 | -.811 | -.170 | .170+01 | .389+00 | .155+00 | .677+00 | .174+01 | .225+00 |
| -.2 | .189 | -.283 | -.483 | -.011 | .155+01 | .521+00 | .329+00 | .975+00 | .163+01 | .325+00 |
| .0 | .119 | -.216 | -.216 | .119 | .132+01 | .607+00 | .607+00 | .132+01 | .145+01 | .433+00 |
| .2 | .029 | -.216 | -.016 | .229 | .107+01 | .609+00 | .965+00 | .169+01 | .123+01 | .518+00 |
| .4 | -.065 | -.255 | .145 | .335 | .862+00 | .555+00 | .140+01 | .216+01 | .103+01 | .573+00 |
| .6 | -.157 | -.311 | .299 | .443 | .696+00 | .489+00 | .195+01 | .277+01 | .851+00 | .612+00 |
| .8 | -.251 | -.375 | .425 | .549 | .561+00 | .422+00 | .266+01 | .354+01 | .702+00 | .644+00 |
| 1.0 | -.346 | -.445 | .555 | .654 | .451+00 | .359+00 | .359+01 | .451+01 | .576+00 | .672+00 |
| 1.2 | -.443 | -.519 | .681 | .757 | .361+00 | .302+00 | .479+01 | .572+01 | .471+00 | .698+00 |
| 1.4 | -.542 | -.597 | .803 | .858 | .287+00 | .253+00 | .636+01 | .721+01 | .383+00 | .723+00 |
| 1.6 | -.644 | -.675 | .925 | .956 | .227+00 | .211+00 | .841+01 | .903+01 | .310+00 | .750+00 |
| 1.8 | -.752 | -.754 | 1.046 | 1.048 | .177+00 | .176+00 | .111+02 | .112+02 | .250+00 | .783+00 |
| 2.0 | -.867 | -.832 | 1.168 | 1.133 | .136+00 | .147+00 | .147+02 | .136+02 | .200+00 | .825+00 |
| 2.2 | -.996 | -.911 | 1.289 | 1.204 | .101+00 | .123+00 | .195+02 | .160+02 | .159+00 | .883+00 |
| 2.4 | -1.150 | -.992 | 1.408 | 1.250 | .709-01 | .102+00 | .256+02 | .178+02 | .124+00 | .963+00 |
| 2.6 | -1.344 | -1.085 | 1.515 | 1.256 | .453-01 | .822-01 | .327+02 | .180+02 | .939-01 | .107+01 |
| 2.8 | -1.594 | -1.202 | 1.598 | 1.205 | .255-01 | .628-01 | .396+02 | .161+02 | .678-01 | .119+01 |
| 3.0 | -1.905 | -1.349 | 1.651 | 1.095 | .125-01 | .447-01 | .447+02 | .125+02 | .464-01 | .130+01 |
| 3.4 | -2.639 | -1.710 | 1.690 | .761 | .229-02 | .195-01 | .490+02 | .576+01 | .196-01 | .145+01 |
| 3.8 | -3.427 | -2.102 | 1.698 | .373 | .374-03 | .790-02 | .498+02 | .236+01 | .791-02 | .152+01 |
| 4.2 | -4.225 | -2.501 | 1.699 | -.025 | .595-04 | .315-02 | .500+02 | .943+00 | .315-02 | .155+01 |
| 4.6 | -5.025 | -2.901 | 1.699 | -.425 | .944-05 | .126-02 | .500+02 | .376+00 | .126-02 | .156+01 |
| 5.0 | -5.825 | -3.301 | 1.699 | -.825 | .150-05 | .500-03 | .500+02 | .150+00 | .500-03 | .157+01 |

EXACT ZIMM EIGENVALUES N= 50 H*= .10

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .669-02 | .331+01 | .302+00 | .283+03 | 1.898 | .527 | .250+05 | 1.1221 | .312 | 1.552 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .278 | -2.750 | -5.550 | -2.522 | .190+01 | .178-02 | .282-05 | .301-02 | .190+01 | .937-03 |
| -2.0 | .278 | -1.950 | -3.950 | -1.722 | .190+01 | .112-01 | .112-03 | .190-01 | .190+01 | .591-02 |
| -1.8 | .278 | -1.750 | -3.550 | -1.522 | .190+01 | .178-01 | .282-03 | .301-01 | .190+01 | .937-02 |
| -1.4 | .278 | -1.351 | -2.751 | -1.122 | .190+01 | .446-01 | .178-02 | .755-01 | .190+01 | .235-01 |
| -1.0 | .276 | -.954 | -1.954 | -.724 | .189+01 | .111+00 | .111-01 | .189+00 | .189+01 | .589-01 |
| -.8 | .272 | -.760 | -1.560 | -.528 | .187+01 | .174+00 | .276-01 | .297+00 | .188+01 | .926-01 |
| -.6 | .264 | -.574 | -1.174 | -.336 | .184+01 | .267+00 | .670-01 | .461+00 | .186+01 | .144+00 |
| -.4 | .245 | -.407 | -.807 | -.155 | .176+01 | .392+00 | .156+00 | .699+00 | .180+01 | .219+00 |
| -.2 | .205 | -.279 | -.479 | .005 | .160+01 | .526+00 | .332+00 | .101+01 | .169+01 | .318+00 |
| .0 | .137 | -.211 | -.211 | .137 | .137+01 | .615+00 | .615+00 | .137+01 | .150+01 | .422+00 |
| .2 | .050 | -.208 | -.008 | .250 | .112+01 | .619+00 | .981+00 | .178+01 | .128+01 | .504+00 |
| .4 | -.041 | -.245 | .155 | .359 | .910+00 | .569+00 | .143+01 | .229+01 | .107+01 | .559+00 |
| .6 | -.131 | -.298 | .302 | .469 | .740+00 | .504+00 | .201+01 | .294+01 | .895+00 | .598+00 |
| .8 | -.222 | -.359 | .441 | .578 | .599+00 | .438+00 | .276+01 | .378+01 | .742+00 | .631+00 |
| 1.0 | -.316 | -.426 | .574 | .684 | .483+00 | .375+00 | .375+01 | .483+01 | .612+00 | .660+00 |
| 1.2 | -.411 | -.497 | .703 | .789 | .388+00 | .318+00 | .505+01 | .615+01 | .502+00 | .687+00 |
| 1.4 | -.509 | -.571 | .829 | .891 | .309+00 | .268+00 | .674+01 | .777+01 | .410+00 | .715+00 |
| 1.6 | -.612 | -.646 | .954 | .988 | .245+00 | .226+00 | .899+01 | .973+01 | .333+00 | .745+00 |
| 1.8 | -.720 | -.722 | 1.078 | 1.080 | .191+00 | .190+00 | .120+02 | .120+02 | .269+00 | .783+00 |
| 2.0 | -.838 | -.797 | 1.203 | 1.162 | .145+00 | .160+00 | .160+02 | .145+02 | .216+00 | .833+00 |
| 2.2 | -.973 | -.873 | 1.327 | 1.227 | .106+00 | .134+00 | .212+02 | .169+02 | .171+00 | .900+00 |
| 2.4 | -1.139 | -.955 | 1.445 | 1.261 | .727-01 | .111+00 | .278+02 | .183+02 | .133+00 | .990+00 |
| 2.6 | -1.351 | -1.054 | 1.546 | 1.249 | .446-01 | .883-01 | .352+02 | .178+02 | .989-01 | .110+01 |
| 2.8 | -1.623 | -1.181 | 1.619 | 1.177 | .238-01 | .660-01 | .416+02 | .150+02 | .701-01 | .122+01 |
| 3.0 | -1.951 | -1.338 | 1.662 | 1.049 | .112-01 | .460-01 | .460+02 | .112+02 | .473-01 | .133+01 |
| 3.4 | -2.702 | -1.707 | 1.693 | .698 | .198-02 | .196-01 | .493+02 | .499+01 | .197-01 | .147+01 |
| 3.8 | -3.494 | -2.102 | 1.698 | .306 | .321-03 | .791-02 | .499+02 | .202+01 | .791-02 | .153+01 |
| 4.2 | -4.292 | -2.501 | 1.699 | -.092 | .510-04 | .315-02 | .500+02 | .809+00 | .315-02 | .155+01 |
| 4.6 | -5.092 | -2.901 | 1.699 | -.492 | .809-05 | .126-02 | .500+02 | .322+00 | .126-02 | .156+01 |
| 5.0 | -5.8?2 | -3.301 | 1.699 | -.892 | .128-05 | .500-03 | .500+02 | .128+00 | .500-03 | .157+01 |

EXACT ZIMM EIGENVALUES N= 50 H*= .130

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .755-02 | .311+01 | .322+00 | .260+03 | 1.963 | .509 | .198+05 | 1.1309 | .293 | 1.851 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .293 | -2.747 | -5.547 | -2.507 | .196+01 | .179-02 | .284-05 | .311-02 | .196+01 | .913-03 |
| -2.0 | .293 | -1.947 | -3.947 | -1.707 | .196+01 | .113-01 | .113-03 | .196-01 | .196+01 | .576-02 |
| -1.8 | .293 | -1.747 | -3.547 | -1.507 | .196+01 | .179-01 | .284-03 | .311-01 | .196+01 | .913-02 |
| -1.4 | .293 | -1.347 | -2.747 | -1.107 | .196+01 | .450-01 | .179-02 | .781-01 | .196+01 | .229-01 |
| -1.0 | .291 | -.950 | -1.950 | -.709 | .195+01 | .112+00 | .112-01 | .195+00 | .196+01 | .573-01 |
| -.8 | .287 | -.756 | -1.556 | -.513 | .194+01 | .175+00 | .278-01 | .307+00 | .195+01 | .902-01 |
| -.6 | .279 | -.570 | -1.170 | -.321 | .190+01 | .269+00 | .676-01 | .478+00 | .192+01 | .141+00 |
| -.4 | .260 | -.403 | -.803 | -.140 | .182+01 | .395+00 | .157+00 | .725+00 | .186+01 | .214+00 |
| -.2 | .222 | -.274 | -.474 | .022 | .167+01 | .572+00 | .336+00 | .105+01 | .175+01 | .309+00 |
| .0 | .157 | -.206 | -.206 | .157 | .143+01 | .623+00 | .623+00 | .143+01 | .156+01 | .410+00 |
| .2 | .073 | -.200 | -.000 | .273 | .118+01 | .631+00 | .999+00 | .187+01 | .134+01 | .490+00 |
| .4 | -.015 | -.234 | .166 | .385 | .966+00 | .583+00 | .147+01 | .243+01 | .113+01 | .543+00 |
| .6 | -.102 | -.283 | .317 | .498 | .790+00 | .521+00 | .207+01 | .315+01 | .946+00 | .582+00 |
| .8 | -.191 | -.341 | .459 | .609 | .644+00 | .456+00 | .288+01 | .406+01 | .789+00 | .616+00 |
| 1.0 | -.282 | -.405 | .595 | .718 | .522+00 | .394+00 | .394+01 | .522+01 | .654+00 | .646+00 |
| 1.2 | -.376 | -.473 | .727 | .824 | .421+00 | .337+00 | .534+01 | .667+01 | .539+00 | .675+00 |
| 1.4 | -.473 | -.543 | .857 | .927 | .337+00 | .287+00 | .720+01 | .845+01 | .442+00 | .706+00 |
| 1.6 | -.575 | -.614 | .986 | 1.025 | .266+00 | .243+00 | .969+01 | .106+02 | .361+00 | .741+00 |
| 1.8 | -.685 | -.685 | 1.115 | 1.115 | .207+00 | .206+00 | .130+02 | .130+02 | .292+00 | .785+00 |
| 2.0 | -.807 | -.757 | 1.243 | 1.193 | .156+00 | .175+00 | .175+02 | .156+02 | .234+00 | .843+00 |
| 2.2 | -.951 | -.831 | 1.369 | 1.249 | .112+00 | .147+00 | .234+02 | .177+02 | .185+00 | .922+00 |
| 2.4 | -1.132 | -.916 | 1.484 | 1.268 | .737-01 | .121+00 | .305+02 | .185+02 | .142+00 | .102+01 |
| 2.6 | -1.367 | -1.023 | 1.577 | 1.233 | .429-01 | .949-01 | .378+02 | .171+02 | .104+00 | .115+01 |
| 2.8 | -1.663 | -1.161 | 1.639 | 1.137 | .217-01 | .690-01 | .435+02 | .137+02 | .723-01 | .127+01 |
| 3.0 | -2.009 | -1.328 | 1.672 | .991 | .980-02 | .470-01 | .470+02 | .930+01 | .480-01 | .137+01 |
| 3.4 | -2.773 | -1.706 | 1.694 | .627 | .168-02 | .197-01 | .495+02 | .423+01 | .198-01 | .149+01 |
| 3.8 | -3.567 | -2.102 | 1.698 | .233 | .271-03 | .791-02 | .499+02 | .171+01 | .792-02 | .154+01 |
| 4.2 | -4.366 | -2.501 | 1.699 | -.166 | .430-04 | .315-02 | .500+02 | .682+00 | .315-02 | .156+01 |
| 4.6 | -5.166 | -2.901 | 1.699 | -.566 | .682-05 | .126-02 | .500+02 | .271+00 | .126-02 | .157+01 |
| 5.0 | -5.966 | -3.301 | 1.699 | -.966 | .108-05 | .500-03 | .500+02 | .108+00 | .500-03 | .157+01 |

EXACT ZIMM EIGENVALUES N= 50 H*= .150

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .812-02 | .297+01 | .337+00 | .247+03 | 2.006 | .499 | .172+05 | 1.1362 | .282 | 2.029 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .302 | -2.745 | -5.545 | -2.498 | .201+01 | .180-02 | .285-05 | .318-02 | .201+01 | .898-03 |
| -2.0 | .302 | -1.945 | -3.945 | -1.698 | .201+01 | .114-01 | .114-03 | .201-01 | .201+01 | .566-02 |
| -1.8 | .302 | -1.745 | -3.545 | -1.498 | .201+01 | .190-01 | .285-03 | .318-01 | .201+01 | .898-02 |
| -1.4 | .302 | -1.345 | -2.745 | -1.098 | .200+01 | .452-01 | .180-02 | .798-01 | .200+01 | .225-01 |
| -1.0 | .300 | -.948 | -1.948 | -.700 | .200+01 | .113+00 | .113-01 | .200+00 | .200+01 | .564-01 |
| -.8 | .297 | -.754 | -1.554 | -.503 | .198+01 | .176+00 | .279-01 | .314+00 | .199+01 | .887-01 |
| -.6 | .289 | -.568 | -1.168 | -.311 | .194+01 | .270+00 | .679-01 | .488+00 | .196+01 | .138+00 |
| -.4 | .270 | -.401 | -.801 | -.130 | .186+01 | .397+00 | .158+00 | .742+00 | .191+01 | .210+00 |
| -.2 | .233 | -.272 | -.472 | .033 | .171+01 | .535+00 | .338+00 | .108+01 | .179+01 | .304+00 |
| .0 | .169 | -.202 | -.202 | .169 | .148+01 | .628+00 | .628+00 | .148+01 | .160+01 | .402+00 |
| .2 | .087 | -.195 | .005 | .287 | .122+01 | .638+00 | .101+01 | .194+01 | .138+01 | .481+00 |
| .4 | .001 | -.227 | .173 | .401 | .100+01 | .592+00 | .149+01 | .252+01 | .117+01 | .533+00 |
| .6 | -.084 | -.275 | .325 | .516 | .824+00 | .531+00 | .211+01 | .328+01 | .980+00 | .572+00 |
| .8 | -.171 | -.331 | .469 | .629 | .674+00 | .457+00 | .295+01 | .425+01 | .820+00 | .606+00 |
| 1.0 | -.261 | -.392 | .608 | .739 | .548+00 | .406+00 | .406+01 | .548+01 | .682+00 | .637+00 |
| 1.2 | -.353 | -.457 | .743 | .847 | .443+00 | .349+00 | .553+01 | .702+01 | .564+00 | .667+00 |
| 1.4 | -.450 | -.524 | .876 | .950 | .355+00 | .299+00 | .751+01 | .891+01 | .464+00 | .700+00 |
| 1.6 | -.552 | -.593 | 1.007 | 1.048 | .281+00 | .255+00 | .102+02 | .112+02 | .379+00 | .738+00 |
| 1.8 | -.663 | -.661 | 1.139 | 1.137 | .217+00 | .218+00 | .138+02 | .137+02 | .308+00 | .787+00 |
| 2.0 | -.789 | -.731 | 1.259 | 1.211 | .163+00 | .186+00 | .186+02 | .163+02 | .247+00 | .852+00 |
| 2.2 | -.940 | -.805 | 1.395 | 1.260 | .115+00 | .157+00 | .249+02 | .182+02 | .194+00 | .938+00 |
| 2.4 | -1.132 | -.892 | 1.508 | 1.268 | .739-01 | .128+00 | .322+02 | .185+02 | .148+00 | .105+01 |
| 2.6 | -1.382 | -1.005 | 1.595 | 1.218 | .415-01 | .988-01 | .393+02 | .165+02 | .107+00 | .117+01 |
| 2.8 | -1.693 | -1.151 | 1.649 | 1.107 | .203-01 | .707-01 | .446+02 | .128+02 | .735-01 | .129+01 |
| 3.0 | -2.047 | -1.323 | 1.677 | .953 | .897-02 | .476-01 | .476+02 | .897+01 | .484-01 | .138+01 |
| 3.4 | -2.819 | -1.705 | 1.695 | .581 | .152-02 | .197-01 | .496+02 | .381+01 | .198-01 | .149+01 |
| 3.8 | -3.614 | -2.102 | 1.698 | .185 | .243-03 | .791-02 | .499+02 | .153+01 | .792-02 | .154+01 |
| 4.2 | -4.413 | -2.501 | 1.699 | -.213 | .386-04 | .315-02 | .500+02 | .612+00 | .315-02 | .156+01 |
| 4.6 | -5.213 | -2.901 | 1.699 | -.613 | .612-05 | .126-02 | .500+02 | .244+00 | .126-02 | .157+01 |
| 5.0 | -6.013 | -3.301 | 1.699 | -1.013 | .970-06 | .500-03 | .500+02 | .970-01 | .500-03 | .157+01 |

#1250

EXACT ZIMM EIGENVALUES N= 50 H*= .20

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .953-02 | .263+01 | .380+00 | .221+03 | 2.110 | .474 | .126+05 | 1.1492 | .258 | 2.424 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .324 | -2.740 | -5.540 | -2.476 | .211+01 | .182-02 | .288-05 | .334-02 | .211+01 | .863-03 |
| -2.0 | .324 | -1.940 | -3.940 | -1.676 | .211+01 | .115-01 | .115-03 | .211-01 | .211+01 | .544-02 |
| -1.8 | .324 | -1.740 | -3.540 | -1.476 | .211+01 | .182-01 | .288-03 | .334-01 | .211+01 | .862-02 |
| -1.4 | .324 | -1.341 | -2.741 | -1.076 | .211+01 | .456-01 | .182-02 | .839-01 | .211+01 | .216-01 |
| -1.0 | .322 | -.944 | -1.944 | -.678 | .210+01 | .114+00 | .114-01 | .210+00 | .210+01 | .542-01 |
| -.8 | .319 | -.749 | -1.549 | -.481 | .208+01 | .178+00 | .282-01 | .330+00 | .209+01 | .852-01 |
| -.6 | .311 | -.563 | -1.163 | -.289 | .205+01 | .273+00 | .687-01 | .514+00 | .207+01 | .133+00 |
| -.4 | .294 | -.396 | -.796 | -.106 | .197+01 | .402+00 | .160+00 | .783+00 | .201+01 | .202+00 |
| -.2 | .258 | -.266 | -.466 | .058 | .181+01 | .542+00 | .342+00 | .114+01 | .189+01 | .291+00 |
| .0 | .198 | -.195 | -.195 | .198 | .158+01 | .639+00 | .639+00 | .158+01 | .170+01 | .385+00 |
| .2 | .120 | -.185 | .015 | .320 | .132+01 | .653+00 | .104+01 | .209+01 | .147+01 | .460+00 |
| .4 | .040 | -.213 | .187 | .440 | .110+01 | .613+00 | .154+01 | .275+01 | .126+01 | .510+00 |
| .6 | -.042 | -.256 | .344 | .558 | .909+00 | .555+00 | .221+01 | .362+01 | .106+01 | .548+00 |
| .8 | -.125 | -.306 | .494 | .675 | .750+00 | .494+00 | .312+01 | .473+01 | .899+00 | .582+00 |
| 1.0 | -.211 | -.362 | .638 | .789 | .616+00 | .435+00 | .435+01 | .616+01 | .754+00 | .615+00 |
| 1.2 | -.300 | -.420 | .780 | .900 | .501+00 | .380+00 | .602+01 | .794+01 | .629+00 | .649+00 |
| 1.4 | -.395 | -.481 | .919 | 1.005 | .403+00 | .331+00 | .830+01 | .101+02 | .521+00 | .687+00 |
| 1.6 | -.497 | -.542 | 1.058 | 1.103 | .318+00 | .287+00 | .114+02 | .127+02 | .429+00 | .735+00 |
| 1.8 | -.613 | -.603 | 1.197 | 1.187 | .244+00 | .249+00 | .157+02 | .154+02 | .343+00 | .796+00 |
| 2.0 | -.749 | -.668 | 1.332 | 1.251 | .173+00 | .215+00 | .215+02 | .178+02 | .279+00 | .878+00 |
| 2.2 | -.920 | -.742 | 1.458 | 1.280 | .120+00 | .181+00 | .287+02 | .190+02 | .217+00 | .985+00 |
| 2.4 | -1.145 | -.840 | 1.560 | 1.255 | .716-01 | .145+00 | .363+02 | .180+02 | .161+00 | .111+01 |
| 2.6 | -1.432 | -.971 | 1.629 | 1.168 | .370-01 | .107+00 | .426+02 | .147+02 | .113+00 | .124+01 |
| 2.8 | -1.772 | -1.132 | 1.668 | 1.028 | .169-01 | .736-01 | .465+02 | .107+02 | .757-01 | .135+01 |
| 3.0 | -2.144 | -1.314 | 1.686 | .855 | .718-02 | .485-01 | .485+02 | .718+01 | .490-01 | .142+01 |
| 3.4 | -2.927 | -1.703 | 1.697 | .473 | .118-02 | .198-01 | .498+02 | .297+01 | .198-01 | .151+01 |
| 3.8 | -3.724 | -2.101 | 1.699 | .076 | .189-03 | .792-02 | .500+02 | .119+01 | .792-02 | .155+01 |
| 4.2 | -4.524 | -2.501 | 1.699 | -.324 | .299-04 | .315-02 | .500+02 | .475+00 | .315-02 | .156+01 |
| 4.6 | -5.324 | -2.901 | 1.699 | -.724 | .475-05 | .126-02 | .500+02 | .189+00 | .126-02 | .157+01 |
| 5.0 | -6.124 | -3.301 | 1.699 | -1.124 | .752-06 | .500-03 | .500+02 | .752-01 | .500-03 | .157+01 |

EXACT ZIMM EIGENVALUES N= 50 H*= .250

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .109-01 | .229+01 | .437+00 | .203+03 | 2.215 | .452 | .969+04 | 1.1587 | .236 | 2.773 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .345 | -2.736 | -5.536 | -2.455 | .221+01 | .184-02 | .291-05 | .351-02 | .221+01 | .829-03 |
| -2.0 | .345 | -1.936 | -3.936 | -1.655 | .271+01 | .116-01 | .116-03 | .221-01 | .221+01 | .523-02 |
| -1.8 | .345 | -1.736 | -3.536 | -1.455 | .221+01 | .184-01 | .291-03 | .351-01 | .221+01 | .829-02 |
| -1.4 | .345 | -1.337 | -2.737 | -1.055 | .221+01 | .461-01 | .183-02 | .881-01 | .221+01 | .208-01 |
| -1.0 | .343 | -.940 | -1.940 | -.657 | .220+01 | .115+00 | .115-01 | .220+00 | .221+01 | .521-01 |
| -.8 | .340 | -.745 | -1.545 | -.460 | .219+01 | .180+00 | .285-01 | .347+00 | .220+01 | .819-01 |
| -.6 | .333 | -.559 | -1.159 | -.267 | .215+01 | .276+00 | .693-01 | .541+00 | .217+01 | .127+00 |
| -.4 | .316 | -.391 | -.791 | -.084 | .207+01 | .406+00 | .162+00 | .825+00 | .211+01 | .194+00 |
| -.2 | .282 | -.261 | -.461 | .082 | .192+01 | .549+00 | .346+00 | .121+01 | .199+01 | .279+00 |
| .0 | .225 | -.188 | -.188 | .225 | .168+01 | .649+00 | .649+00 | .168+01 | .180+01 | .369+00 |
| .2 | .152 | -.176 | .024 | .352 | .142+01 | .667+00 | .106+01 | .225+01 | .157+01 | .439+00 |
| .4 | .076 | -.200 | .200 | .476 | .119+01 | .631+00 | .158+01 | .299+01 | .135+01 | .487+00 |
| .6 | -.001 | -.238 | .362 | .599 | .997+00 | .578+00 | .230+01 | .397+01 | .115+01 | .525+00 |
| .8 | -.080 | -.284 | .516 | .720 | .832+00 | .520+00 | .328+01 | .525+01 | .981+00 | .559+00 |
| 1.0 | -.162 | -.333 | .667 | .838 | .688+00 | .464+00 | .464+01 | .688+01 | .830+00 | .593+00 |
| 1.2 | -.249 | -.385 | .815 | .951 | .564+00 | .412+00 | .653+01 | .894+01 | .698+00 | .531+00 |
| 1.4 | -.342 | -.437 | .963 | 1.058 | .455+00 | .365+00 | .918+01 | .114+02 | .583+00 | .677+00 |
| 1.6 | -.446 | -.490 | 1.110 | 1.154 | .358+00 | .324+00 | .129+02 | .143+02 | .483+00 | .735+00 |
| 1.8 | -.567 | -.544 | 1.256 | 1.233 | .271+00 | .286+00 | .180+02 | .171+02 | .394+00 | .812+00 |
| 2.0 | -.718 | -.606 | 1.394 | 1.282 | .191+00 | .248+00 | .248+02 | .191+02 | .313+00 | .914+00 |
| 2.2 | -.917 | -.686 | 1.514 | 1.283 | .171+00 | .206+00 | .326+02 | .192+02 | .239+00 | .104+01 |
| 2.4 | -1.177 | -.799 | 1.601 | 1.223 | .666-01 | .159+00 | .399+02 | .167+02 | .172+00 | .117+01 |
| 2.6 | -1.496 | -.946 | 1.654 | 1.104 | .319-01 | .113+00 | .450+02 | .127+02 | .118+00 | .130+01 |
| 2.8 | -1.857 | -1.121 | 1.679 | .943 | .139-01 | .758-01 | .478+02 | .876+01 | .770-01 | .139+01 |
| 3.0 | -2.240 | -1.309 | 1.691 | .760 | .575-02 | .491-01 | .491+02 | .575+01 | .494-01 | .145+01 |
| 3.4 | -3.030 | -1.702 | 1.698 | .370 | .933-03 | .198-01 | .499+02 | .234+01 | .199-01 | .152+01 |
| 3.8 | -3.829 | -2.101 | 1.699 | -.029 | .148-03 | .792-02 | .500+02 | .936+00 | .792-02 | .155+01 |
| 4.2 | -4.628 | -2.501 | 1.699 | -.428 | .235-04 | .315-02 | .500+02 | .373+00 | .315-02 | .156+01 |
| 4.6 | -5.428 | -2.901 | 1.699 | -.828 | .373-05 | .126-02 | .500+02 | .148+00 | .126-02 | .157+01 |
| 5.0 | -6.228 | -3.301 | 1.699 | -1.228 | .591-06 | .500-03 | .500+02 | .591-01 | .500-03 | .157+01 |

#1250

EXACT ZIMM EIGENVALUES N= 50 H*= .262

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JFR | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .113-01 | .221+01 | .453+00 | .199+03 | 2.241 | .446 | .914+04 | 1.1611 | .231 | 2.853 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .350 | -2.735 | -5.535 | -2.450 | .224+01 | .184-02 | .292-05 | .355-02 | .224+01 | .821-03 |
| -2.0 | .350 | -1.935 | -3.935 | -1.650 | .224+01 | .116-01 | .116-03 | .224-01 | .224+01 | .518-02 |
| -1.8 | .350 | -1.735 | -3.535 | -1.450 | .224+01 | .184-01 | .292-03 | .355-01 | .224+01 | .821-02 |
| -1.4 | .350 | -1.336 | -2.736 | -1.050 | .224+01 | .462-01 | .184-02 | .891-01 | .224+01 | .206-01 |
| -1.0 | .348 | -.939 | -1.939 | -.652 | .223+01 | .115+00 | .115-01 | .223+00 | .223+01 | .516-01 |
| -.8 | .345 | -.744 | -1.544 | -.455 | .222+01 | .180+00 | .285-01 | .351+00 | .222+01 | .811-01 |
| -.6 | .338 | -.558 | -1.158 | -.262 | .218+01 | .277+00 | .695-01 | .547+00 | .220+01 | .126+00 |
| -.4 | .322 | -.390 | -.790 | -.078 | .210+01 | .407+00 | .162+00 | .835+00 | .214+01 | .192+00 |
| -.2 | .288 | -.259 | -.459 | .088 | .194+01 | .550+00 | .347+00 | .122+01 | .202+01 | .276+00 |
| .0 | .232 | -.187 | -.187 | .232 | .170+01 | .651+00 | .651+00 | .170+01 | .182+01 | .365+00 |
| .2 | .160 | -.174 | .026 | .360 | .144+01 | .670+00 | .106+01 | .229+01 | .159+01 | .435+00 |
| .4 | .084 | -.197 | .203 | .484 | .121+01 | .635+00 | .160+01 | .305+01 | .137+01 | .482+00 |
| .6 | .008 | -.234 | .366 | .608 | .102+01 | .583+00 | .232+01 | .406+01 | .117+01 | .519+00 |
| .8 | -.070 | -.273 | .521 | .730 | .852+00 | .527+00 | .332+01 | .538+01 | .100+01 | .553+00 |
| 1.0 | -.151 | -.327 | .673 | .849 | .707+00 | .471+00 | .471+01 | .707+01 | .850+00 | .588+00 |
| 1.2 | -.237 | -.376 | .824 | .963 | .580+00 | .420+00 | .666+01 | .919+01 | .716+00 | .627+00 |
| 1.4 | -.330 | -.427 | .973 | 1.070 | .468+00 | .374+00 | .940+01 | .118+02 | .600+00 | .674+00 |
| 1.6 | -.434 | -.477 | 1.123 | 1.166 | .368+00 | .333+00 | .133+02 | .147+02 | .497+00 | .736+00 |
| 1.8 | -.557 | -.530 | 1.270 | 1.243 | .277+00 | .295+00 | .186+02 | .175+02 | .405+00 | .817+00 |
| 2.0 | -.713 | -.591 | 1.409 | 1.287 | .194+00 | .256+00 | .256+02 | .194+02 | .321+00 | .924+00 |
| 2.2 | -.918 | -.674 | 1.526 | 1.282 | .121+00 | .212+00 | .336+02 | .191+02 | .244+00 | .105+01 |
| 2.4 | -1.187 | -.790 | 1.610 | 1.213 | .650-01 | .162+00 | .407+02 | .163+02 | .175+00 | .119+01 |
| 2.6 | -1.514 | -.942 | 1.658 | 1.086 | .306-01 | .114+00 | .455+02 | .122+02 | .118+00 | .131+01 |
| 2.8 | -1.879 | -1.118 | 1.682 | .921 | .132-01 | .761-01 | .480+02 | .834+01 | .773-01 | .140+01 |
| 3.0 | -2.263 | -1.308 | 1.692 | .737 | .545-02 | .492-01 | .492+02 | .545+01 | .495-01 | .146+01 |
| 3.4 | -3.055 | -1.702 | 1.698 | .345 | .882-03 | .199-01 | .499+02 | .222+01 | .199-01 | .153+01 |
| 3.8 | -3.853 | -2.101 | 1.699 | -.053 | .140-03 | .792-02 | .500+02 | .885+00 | .792-02 | .155+01 |
| 4.2 | -4.653 | -2.501 | 1.699 | -.453 | .222-04 | .315-02 | .500+02 | .352+00 | .315-02 | .156+01 |
| 4.6 | -5.453 | -2.901 | 1.699 | -.853 | .352-05 | .126-02 | .500+02 | .140+00 | .126-02 | .157+01 |
| 5.0 | -6.253 | -3.301 | 1.699 | -1.253 | .559-06 | .500-03 | .500+02 | .559-01 | .500-03 | .157+01 |

EXACT ZIMM EIGENVALUES N= 50 H*= .30

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .123-01 | .195+01 | .514+00 | .189+03 | 2.326 | .430 | .769+04 | 1.1684 | .216 | 3.101 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .367 | -2.732 | -5.532 | -2.433 | .233+01 | .185-02 | .293-05 | .369-02 | .233+01 | .796-03 |
| -2.0 | .367 | -1.932 | -3.932 | -1.633 | .233+01 | .117-01 | .117-03 | .233-01 | .233+01 | .502-02 |
| -1.8 | .367 | -1.733 | -3.533 | -1.433 | .233+01 | .185-01 | .293-03 | .369-01 | .233+01 | .796-02 |
| -1.4 | .366 | -1.333 | -2.733 | -1.034 | .232+01 | .465-01 | .185-02 | .925-01 | .232+01 | .200-01 |
| -1.0 | .365 | -.936 | -1.936 | -.635 | .232+01 | .116+00 | .116-01 | .232+00 | .232+01 | .500-01 |
| -.8 | .362 | -.742 | -1.542 | -.438 | .230+01 | .181+00 | .287-01 | .365+00 | .231+01 | .726-01 |
| -.6 | .355 | -.555 | -1.155 | -.245 | .226+01 | .278+00 | .699-01 | .569+00 | .228+01 | .122+00 |
| -.4 | .339 | -.387 | -.787 | -.061 | .218+01 | .410+00 | .163+00 | .869+00 | .222+01 | .186+00 |
| -.2 | .306 | -.256 | -.456 | .106 | .203+01 | .555+00 | .350+00 | .128+01 | .210+01 | .267+00 |
| .0 | .252 | -.182 | -.182 | .252 | .179+01 | .658+00 | .658+00 | .179+01 | .191+01 | .352+00 |
| .2 | .183 | -.167 | .033 | .383 | .153+01 | .680+00 | .108+01 | .242+01 | .167+01 | .419+00 |
| .4 | .111 | -.188 | .212 | .511 | .129+01 | .648+00 | .163+01 | .325+01 | .145+01 | .465+00 |
| .6 | .039 | -.222 | .378 | .639 | .109+01 | .599+00 | .239+01 | .436+01 | .125+01 | .501+00 |
| .8 | -.036 | -.262 | .538 | .764 | .921+00 | .547+00 | .345+01 | .581+01 | .107+01 | .536+00 |
| 1.0 | -.114 | -.305 | .695 | .886 | .769+00 | .495+00 | .495+01 | .769+01 | .915+00 | .572+00 |
| 1.2 | -.197 | -.349 | .851 | 1.003 | .635+00 | .448+00 | .710+01 | .101+02 | .777+00 | .615+00 |
| 1.4 | -.290 | -.392 | 1.006 | 1.110 | .513+00 | .406+00 | .102+02 | .129+02 | .654+00 | .669+00 |
| 1.6 | -.396 | -.435 | 1.165 | 1.204 | .402+00 | .367+00 | .146+02 | .160+02 | .544+00 | .740+00 |
| 1.8 | -.527 | -.483 | 1.317 | 1.273 | .297+00 | .329+00 | .208+02 | .187+02 | .443+00 | .837+00 |
| 2.0 | -.699 | -.545 | 1.455 | 1.301 | .200+00 | .285+00 | .285+02 | .200+02 | .348+00 | .960+00 |
| 2.2 | -.931 | -.637 | 1.563 | 1.269 | .117+00 | .231+00 | .366+02 | .186+02 | .259+00 | .110+01 |
| 2.4 | -1.226 | -.767 | 1.633 | 1.174 | .594-01 | .171+00 | .430+02 | .149+02 | .181+00 | .124+01 |
| 2.6 | -1.572 | -.930 | 1.670 | 1.028 | .268-01 | .117+00 | .468+02 | .107+02 | .120+00 | .135+01 |
| 2.8 | -1.948 | -1.113 | 1.687 | .852 | .113-01 | .771-01 | .486+02 | .712+01 | .779-01 | .143+01 |
| 3.0 | -2.337 | -1.306 | 1.694 | .663 | .460-02 | .494-01 | .494+02 | .460+01 | .497-01 | .148+01 |
| 3.4 | -3.132 | -1.702 | 1.698 | .268 | .739-03 | .199-01 | .499+02 | .186+01 | .199-01 | .153+01 |
| 3.8 | -3.931 | -2.101 | 1.699 | -.131 | .117-03 | .792-02 | .500+02 | .740+00 | .792-02 | .156+01 |
| 4.2 | -4.731 | -2.501 | 1.699 | -.531 | .186-04 | .315-02 | .500+02 | .295+00 | .315-02 | .156+01 |
| 4.6 | -5.530 | -2.901 | 1.699 | -.930 | .295-05 | .126-02 | .500+02 | .117+00 | .126-02 | .157+01 |
| 5.0 | -6.330 | -3.301 | 1.699 | -1.330 | .467-06 | .500-03 | .500+02 | .467-01 | .500-03 | .157+01 |

#1250

EXACT ZIMM EIGENVALUES N=100 H*= .05

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .157-02 | .366+01 | .273+00 | .116+04 | 1.821 | .549 | .450+06 | 1.1099 | .335 | 1.123 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .250 | -2.735 | -5.555 | -2.540 | .182+01 | .176-02 | .279-05 | .289-02 | .182+01 | .966-03 |
| -2.0 | .260 | -1.955 | -3.955 | -1.740 | .192+01 | .111-01 | .111-03 | .182-01 | .182+01 | .610-02 |
| -1.8 | .260 | -1.755 | -3.555 | -1.540 | .182+01 | .176-01 | .279-03 | .289-01 | .182+01 | .966-02 |
| -1.4 | .260 | -1.355 | -2.755 | -1.140 | .182+01 | .441-01 | .176-02 | .724-01 | .182+01 | .242-01 |
| -1.0 | .258 | -.959 | -1.959 | -.742 | .181+01 | .110+00 | .110-01 | .181+00 | .181+01 | .607-01 |
| -.8 | .254 | -.764 | -1.564 | -.546 | .180+01 | .172+00 | .273-01 | .285+00 | .180+01 | .955-01 |
| -.6 | .245 | -.579 | -1.179 | -.355 | .176+01 | .264+00 | .663-01 | .442+00 | .178+01 | .149+00 |
| -.4 | .225 | -.412 | -.812 | -.175 | .168+01 | .387+00 | .154+00 | .669+00 | .172+01 | .226+00 |
| -.2 | .184 | -.285 | -.485 | -.016 | .153+01 | .519+00 | .327+00 | .963+00 | .161+01 | .328+00 |
| .0 | .113 | -.219 | -.219 | .113 | .130+01 | .604+00 | .604+00 | .130+01 | .143+01 | .436+00 |
| .2 | .022 | -.219 | -.019 | .222 | .105+01 | .603+00 | .956+00 | .167+01 | .121+01 | .521+00 |
| .4 | -.073 | -.261 | .139 | .327 | .846+00 | .549+00 | .138+01 | .213+01 | .101+01 | .575+00 |
| .6 | -.165 | -.318 | .282 | .435 | .683+00 | .481+00 | .191+01 | .272+01 | .836+00 | .613+00 |
| .8 | -.259 | -.384 | .416 | .541 | .551+00 | .413+00 | .261+01 | .348+01 | .689+00 | .644+00 |
| 1.0 | -.353 | -.456 | .544 | .647 | .443+00 | .350+00 | .350+01 | .443+01 | .565+00 | .658+00 |
| 1.2 | -.449 | -.533 | .667 | .751 | .356+00 | .293+00 | .464+01 | .564+01 | .461+00 | .689+00 |
| 1.4 | -.545 | -.614 | .786 | .855 | .285+00 | .243+00 | .611+01 | .716+01 | .375+00 | .707+00 |
| 1.6 | -.643 | -.697 | .903 | .957 | .228+00 | .201+00 | .800+01 | .907+01 | .304+00 | .723+00 |
| 1.8 | -.742 | -.782 | 1.018 | 1.058 | .181+00 | .165+00 | .104+02 | .114+02 | .245+00 | .739+00 |
| 2.0 | -.843 | -.867 | 1.133 | 1.157 | .144+00 | .136+00 | .136+02 | .144+02 | .198+00 | .757+00 |
| 2.2 | -.946 | -.953 | 1.247 | 1.254 | .113+00 | .111+00 | .177+02 | .179+02 | .159+00 | .778+00 |
| 2.4 | -1.055 | -1.038 | 1.362 | 1.345 | .882-01 | .917-01 | .230+02 | .221+02 | .127+00 | .805+00 |
| 2.6 | -1.171 | -1.121 | 1.479 | 1.429 | .675-01 | .757-01 | .301+02 | .269+02 | .101+00 | .843+00 |
| 2.8 | -1.300 | -1.203 | 1.597 | 1.500 | .501-01 | .627-01 | .395+02 | .316+02 | .802-01 | .897+00 |
| 3.0 | -1.454 | -1.287 | 1.713 | 1.546 | .352-01 | .516-01 | .516+02 | .352+02 | .625-01 | .972+00 |
| 3.4 | -1.897 | -1.500 | 1.900 | 1.503 | .127-01 | .316-01 | .794+02 | .318+02 | .340-01 | .119+01 |
| 3.8 | -2.561 | -1.821 | 1.979 | 1.239 | .275-02 | .151-01 | .953+02 | .173+02 | .153-01 | .139+01 |
| 4.2 | -3.333 | -2.204 | 1.996 | .867 | .465-03 | .626-02 | .992+02 | .737+01 | .628-02 | .150+01 |
| 4.6 | -4.128 | -2.601 | 1.999 | .472 | .745-04 | .251-02 | .999+02 | .297+01 | .251-02 | .154+01 |
| 5.0 | -4.927 | -3.000 | 2.000 | .073 | .118-04 | .100-02 | .100+03 | .118+01 | .100-02 | .156+01 |

EXACT ZIMM EIGENVALUES N=100 H*= .075

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .187-02 | .349+01 | .287+00 | .101+04 | 1.891 | .529 | .321+06 | 1.1196 | .313 | 1.469 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .277 | -2.751 | -5.551 | -2.523 | .189+01 | .177-02 | .281-05 | .300-02 | .189+01 | .939-03 |
| -2.0 | .277 | -1.951 | -3.951 | -1.723 | .189+01 | .112-01 | .112-03 | .189-01 | .189+01 | .592-02 |
| -1.8 | .277 | -1.751 | -3.551 | -1.523 | .189+01 | .177-01 | .281-03 | .300-01 | .189+01 | .938-02 |
| -1.4 | .276 | -1.352 | -2.752 | -1.124 | .189+01 | .445-01 | .177-02 | .752-01 | .189+01 | .236-01 |
| -1.0 | .274 | -.955 | -1.955 | -.726 | .188+01 | .111+00 | .111-01 | .188+00 | .188+01 | .589-01 |
| -.8 | .271 | -.761 | -1.561 | -.529 | .187+01 | .174+00 | .275-01 | .296+00 | .187+01 | .928-01 |
| -.6 | .262 | -.575 | -1.175 | -.338 | .183+01 | .266+00 | .669-01 | .460+00 | .185+01 | .144+00 |
| -.4 | .243 | -.408 | -.808 | -.157 | .175+01 | .391+00 | .156+00 | .696+00 | .179+01 | .220+00 |
| -.2 | .203 | -.280 | -.480 | .003 | .160+01 | .525+00 | .331+00 | .101+01 | .168+01 | .318+00 |
| .0 | .135 | -.213 | -.213 | .135 | .136+01 | .613+00 | .613+00 | .136+01 | .150+01 | .422+00 |
| .2 | .048 | -.210 | -.010 | .248 | .112+01 | .616+00 | .976+00 | .177+01 | .127+01 | .504+00 |
| .4 | -.043 | -.248 | .152 | .357 | .906+00 | .565+00 | .142+01 | .227+01 | .107+01 | .557+00 |
| .6 | -.133 | -.302 | .298 | .467 | .737+00 | .499+00 | .199+01 | .293+01 | .890+00 | .595+00 |
| .8 | -.223 | -.365 | .435 | .577 | .598+00 | .432+00 | .273+01 | .377+01 | .738+00 | .626+00 |
| 1.0 | -.315 | -.434 | .566 | .685 | .484+00 | .369+00 | .369+01 | .484+01 | .608+00 | .651+00 |
| 1.2 | -.408 | -.507 | .693 | .792 | .391+00 | .311+00 | .493+01 | .619+01 | .499+00 | .672+00 |
| 1.4 | -.503 | -.585 | .815 | .897 | .314+00 | .260+00 | .654+01 | .789+01 | .408+00 | .692+00 |
| 1.6 | -.599 | -.665 | .935 | 1.001 | .252+00 | .217+00 | .862+01 | .100+02 | .332+00 | .710+00 |
| 1.8 | -.697 | -.746 | 1.054 | 1.103 | .201+00 | .179+00 | .113+02 | .127+02 | .270+00 | .729+00 |
| 2.0 | -.797 | -.828 | 1.172 | 1.203 | .159+00 | .149+00 | .149+02 | .159+02 | .218+00 | .750+00 |
| 2.2 | -.902 | -.910 | 1.290 | 1.298 | .125+00 | .123+00 | .195+02 | .199+02 | .176+00 | .776+00 |
| 2.4 | -1.012 | -.991 | 1.409 | 1.388 | .973-01 | .102+00 | .256+02 | .244+02 | .141+00 | .809+00 |
| 2.6 | -1.133 | -1.071 | 1.529 | 1.467 | .737-01 | .849-01 | .338+02 | .293+02 | .112+00 | .856+00 |
| 2.8 | -1.271 | -1.151 | 1.649 | 1.529 | .535-01 | .706-01 | .445+02 | .338+02 | .886-01 | .922+00 |
| 3.0 | -1.441 | -1.238 | 1.762 | 1.559 | .362-01 | .579-01 | .579+02 | .362+02 | .683-01 | .101+01 |
| 3.4 | -1.940 | -1.472 | 1.928 | 1.460 | .115-01 | .337-01 | .847+02 | .289+02 | .356-01 | .124+01 |
| 3.8 | -2.642 | -1.814 | 1.986 | 1.158 | .228-02 | .153-01 | .968+02 | .144+02 | .155-01 | .142+01 |
| 4.2 | -3.423 | -2.202 | 1.998 | .777 | .378-03 | .628-02 | .995+02 | .598+01 | .629-02 | .151+01 |
| 4.6 | -4.220 | -2.600 | 2.000 | .380 | .603-04 | .251-02 | .999+02 | .240+01 | .251-02 | .155+01 |
| 5.0 | -5.019 | -3.000 | 2.000 | -.019 | .956-05 | .100-02 | .100+03 | .956+00 | .100-02 | .156+01 |

EXACT ZIMM EIGENVALUES N=100 H*= .10

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .217-02 | .331+01 | .302+00 | .902+03 | 1.953 | .512 | .240+06 | 1.1276 | .296 | 1.746 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .291 | -2.748 | -5.548 | -2.509 | .195+01 | .179-02 | .283-05 | .310-02 | .195+01 | .915-03 |
| -2.0 | .291 | -1.948 | -3.948 | -1.709 | .195+01 | .113-01 | .113-03 | .195-01 | .195+01 | .577-02 |
| -1.8 | .291 | -1.748 | -3.548 | -1.509 | .195+01 | .179-01 | .283-03 | .310-01 | .195+01 | .915-02 |
| -1.4 | .290 | -1.348 | -2.748 | -1.110 | .195+01 | .448-01 | .178-02 | .777-01 | .195+01 | .230-01 |
| -1.0 | .288 | -.952 | -1.952 | -.712 | .194+01 | .112+00 | .112-01 | .194+00 | .195+01 | .575-01 |
| -.8 | .285 | -.757 | -1.557 | -.515 | .193+01 | .175+00 | .277-01 | .306+00 | .194+01 | .904-01 |
| -.6 | .277 | -.572 | -1.172 | -.323 | .189+01 | .268+00 | .674-01 | .475+00 | .191+01 | .141+00 |
| -.4 | .258 | -.405 | -.805 | -.142 | .181+01 | .394+00 | .157+00 | .721+00 | .185+01 | .214+00 |
| -.2 | .219 | -.276 | -.476 | .019 | .166+01 | .530+00 | .334+00 | .105+01 | .174+01 | .310+00 |
| .0 | .154 | -.208 | -.208 | .154 | .142+01 | .620+00 | .620+00 | .142+01 | .155+01 | .410+00 |
| .2 | .070 | -.203 | -.003 | .270 | .117+01 | .626+00 | .993+00 | .186+01 | .133+01 | .460+00 |
| .4 | -.018 | -.238 | .162 | .382 | .960+00 | .578+00 | .145+01 | .241+01 | .112+01 | .542+00 |
| .6 | -.105 | -.289 | .311 | .495 | .786+00 | .514+00 | .205+01 | .313+01 | .939+00 | .579+00 |
| .8 | -.193 | -.349 | .451 | .607 | .642+00 | .448+00 | .283+01 | .405+01 | .782+00 | .609+00 |
| 1.0 | -.282 | -.415 | .585 | .718 | .527+00 | .385+00 | .385+01 | .522+01 | .649+00 | .635+00 |
| 1.2 | -.373 | -.486 | .714 | .827 | .424+00 | .327+00 | .518+01 | .671+01 | .535+00 | .657+00 |
| 1.4 | -.466 | -.560 | .840 | .934 | .342+00 | .276+00 | .692+01 | .860+01 | .439+00 | .678+00 |
| 1.6 | -.560 | -.636 | .964 | 1.040 | .275+00 | .231+00 | .919+01 | .110+02 | .359+00 | .698+00 |
| 1.8 | -.657 | -.715 | 1.085 | 1.143 | .220+00 | .193+00 | .122+02 | .139+02 | .293+00 | .719+00 |
| 2.0 | -.757 | -.793 | 1.207 | 1.243 | .175+00 | .161+00 | .161+02 | .175+02 | .238+00 | .744+00 |
| 2.2 | -.862 | -.872 | 1.328 | 1.338 | .137+00 | .134+00 | .213+02 | .218+02 | .192+00 | .774+00 |
| 2.4 | -.975 | -.949 | 1.451 | 1.425 | .106+00 | .112+00 | .282+02 | .266+02 | .154+00 | .815+00 |
| 2.6 | -1.101 | -1.026 | 1.574 | 1.499 | .792-01 | .941-01 | .375+02 | .315+02 | .123+00 | .871+00 |
| 2.8 | -1.250 | -1.106 | 1.694 | 1.550 | .562-01 | .784-01 | .495+02 | .354+02 | .963-01 | .949+00 |
| 3.0 | -1.439 | -1.196 | 1.804 | 1.561 | .364-01 | .637-01 | .637+02 | .364+02 | .734-01 | .105+01 |
| 3.4 | -1.987 | -1.453 | 1.947 | 1.413 | .103-01 | .353-01 | .886+02 | .259+02 | .367-01 | .129+01 |
| 3.8 | -2.716 | -1.810 | 1.990 | 1.084 | .192-02 | .155-01 | .978+02 | .121+02 | .156-01 | .145+01 |
| 4.2 | -3.503 | -2.202 | 1.998 | .697 | .314-03 | .629-02 | .996+02 | .497+01 | .629-02 | .152+01 |
| 4.6 | -4.301 | -2.600 | 2.000 | .299 | .500-04 | .251-02 | .999+02 | .199+01 | .251-02 | .155+01 |
| 5.0 | -5.101 | -3.000 | 2.000 | -.101 | .793-05 | .100-02 | .100+03 | .793+00 | .100-02 | .156+01 |



#1250

EXACT ZIMM EIGENVALUES N=100 H*= .130

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .252-02 | .311+01 | .322+00 | .802+03 | 2.021 | .495 | .179+06 | 1.1355 | .278 | 2.019 |

REDUCED CYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2P | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .306 | -2.745 | -5.545 | -2.494 | .202+01 | .180-02 | .285-05 | .320-02 | .202+01 | .890-03 |
| -2.0 | .306 | -1.945 | -3.945 | -1.694 | .202+01 | .114-01 | .114-03 | .202-01 | .202+01 | .562-02 |
| -1.8 | .306 | -1.745 | -3.545 | -1.494 | .202+01 | .180-01 | .285-03 | .320-01 | .202+01 | .890-02 |
| -1.4 | .305 | -1.345 | -2.745 | -1.095 | .202+01 | .451-01 | .180-02 | .804-01 | .202+01 | .223-01 |
| -1.0 | .303 | -.949 | -1.949 | -.697 | .201+01 | .113+00 | .113-01 | .201+00 | .201+01 | .559-01 |
| -.8 | .300 | -.754 | -1.554 | -.500 | .200+01 | .176+00 | .279-01 | .316+00 | .200+01 | .880-01 |
| -.6 | .292 | -.568 | -1.168 | -.308 | .196+01 | .270+00 | .679-01 | .492+00 | .198+01 | .137+00 |
| -.4 | .274 | -.401 | -.801 | -.126 | .188+01 | .397+00 | .158+00 | .748+00 | .192+01 | .208+00 |
| -.2 | .237 | -.272 | -.472 | .037 | .172+01 | .535+00 | .337+00 | .109+01 | .181+01 | .301+00 |
| .0 | .174 | -.203 | -.203 | .174 | .149+01 | .627+00 | .627+00 | .149+01 | .162+01 | .398+00 |
| .2 | .093 | -.196 | .004 | .293 | .124+01 | .637+00 | .101+01 | .196+01 | .139+01 | .475+00 |
| .4 | .008 | -.229 | .171 | .403 | .102+01 | .591+00 | .148+01 | .256+01 | .118+01 | .525+00 |
| .6 | -.075 | -.277 | .323 | .525 | .841+00 | .529+00 | .211+01 | .335+01 | .993+00 | .562+00 |
| .8 | -.160 | -.333 | .467 | .640 | .691+00 | .464+00 | .293+01 | .436+01 | .833+00 | .592+00 |
| 1.0 | -.247 | -.396 | .604 | .753 | .566+00 | .402+00 | .402+01 | .566+01 | .694+00 | .617+00 |
| 1.2 | -.335 | -.463 | .737 | .865 | .462+00 | .344+00 | .545+01 | .732+01 | .576+00 | .640+00 |
| 1.4 | -.426 | -.534 | .866 | .974 | .375+00 | .293+00 | .735+01 | .943+01 | .476+00 | .662+00 |
| 1.6 | -.518 | -.607 | .993 | 1.082 | .303+00 | .247+00 | .985+01 | .121+02 | .391+00 | .684+00 |
| 1.8 | -.614 | -.681 | 1.119 | 1.186 | .243+00 | .209+00 | .132+02 | .153+02 | .320+00 | .709+00 |
| 2.0 | -.714 | -.755 | 1.245 | 1.286 | .193+00 | .176+00 | .176+02 | .193+02 | .261+00 | .738+00 |
| 2.2 | -.820 | -.829 | 1.371 | 1.380 | .151+00 | .148+00 | .235+02 | .240+02 | .212+00 | .775+00 |
| 2.4 | -.936 | -.903 | 1.497 | 1.464 | .116+00 | .125+00 | .314+02 | .291+02 | .170+00 | .824+00 |
| 2.6 | -1.071 | -.977 | 1.623 | 1.529 | .850-01 | .106+00 | .420+02 | .338+02 | .136+00 | [illegible] |
| 2.8 | -1.235 | -1.057 | 1.743 | 1.565 | .582-01 | .877-01 | .553+02 | .367+02 | .105+00 | .985+00 |
| 3.0 | -1.447 | -1.154 | 1.846 | 1.553 | .358-01 | .701-01 | .701+02 | .358+02 | .787-01 | .110+01 |
| 3.4 | -2.048 | -1.437 | 1.963 | 1.352 | .896-02 | .366-01 | .919+02 | .225+02 | .377-01 | .133+01 |
| 3.8 | -2.799 | -1.806 | 1.994 | 1.001 | .159-02 | .156-01 | .985+02 | .100+02 | .157-01 | .147+01 |
| 4.2 | -3.590 | -2.201 | 1.999 | .610 | .257-03 | .629-02 | .998+02 | .407+01 | .630-02 | .153+01 |
| 4.6 | -4.389 | -2.600 | 2.000 | .211 | .408-04 | .251-02 | .100+03 | .163+01 | .251-02 | .155+01 |
| 5.0 | -5.189 | -3.000 | 2.000 | -.189 | .648-05 | .100-02 | .100+03 | .648+00 | .100-02 | .156+01 |

EXACT ZIMM EIGENVALUES N=100 H*= .15

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .276-02 | .297+01 | .336+00 | .749+03 | 2.064 | .484 | .150+06 | 1.1401 | .268 | 2.175 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .315 | -2.743 | -5.543 | -2.485 | .206+01 | .181-02 | .286-05 | .327-02 | .206+01 | .875-03 |
| -2.0 | .315 | -1.943 | -3.943 | -1.685 | .206+01 | .114-01 | .114-03 | .206-01 | .206+01 | .552-02 |
| -1.8 | .315 | -1.743 | -3.543 | -1.485 | .206+01 | .181-01 | .286-03 | .327-01 | .206+01 | .875-02 |
| -1.4 | .314 | -1.344 | -2.744 | -1.086 | .206+01 | .453-01 | .180-02 | .821-01 | .206+01 | .220-01 |
| -1.0 | .313 | -.947 | -1.947 | -.687 | .205+01 | .113+00 | .113-01 | .205+00 | .206+01 | .550-01 |
| -.8 | .309 | -.753 | -1.553 | -.491 | .204+01 | .177+00 | .280-01 | .323+00 | .205+01 | .865-01 |
| -.6 | .302 | -.567 | -1.167 | -.298 | .200+01 | .271+00 | .682-01 | .503+00 | .202+01 | .135+00 |
| -.4 | .284 | -.399 | -.799 | -.116 | .192+01 | .399+00 | .159+00 | .765+00 | .196+01 | .205+00 |
| -.2 | .247 | -.270 | -.470 | .047 | .177+01 | .537+00 | .339+00 | .111+01 | .185+01 | .295+00 |
| .0 | .186 | -.200 | -.200 | .186 | .153+01 | .631+00 | .631+00 | .153+01 | .166+01 | .391+00 |
| .2 | .107 | -.192 | .008 | .307 | .128+01 | .642+00 | .102+01 | .203+01 | .143+01 | .466+00 |
| .4 | .024 | -.223 | .177 | .424 | .106+01 | .598+00 | .150+01 | .266+01 | .122+01 | .515+00 |
| .6 | -.058 | -.269 | .331 | .542 | .876+00 | .538+00 | .214+01 | .349+01 | .103+01 | .551+00 |
| .8 | -.141 | -.324 | .476 | .659 | .723+00 | .474+00 | .299+01 | .456+01 | .865+00 | .580+00 |
| 1.0 | -.225 | -.385 | .615 | .775 | .595+00 | .412+00 | .412+01 | .595+01 | .724+00 | .606+00 |
| 1.2 | -.312 | -.450 | .750 | .888 | .487+00 | .355+00 | .562+01 | .773+01 | .603+00 | .629+00 |
| 1.4 | -.401 | -.518 | .882 | .999 | .397+00 | .303+00 | .762+01 | .998+01 | .500+00 | .652+00 |
| 1.6 | -.492 | -.583 | 1.012 | 1.108 | .322+00 | .258+00 | .103+02 | .128+02 | .413+00 | .676+00 |
| 1.8 | -.587 | -.660 | 1.140 | 1.213 | .259+00 | .219+00 | .138+02 | .163+02 | .339+00 | .702+00 |
| 2.0 | -.687 | -.731 | 1.269 | 1.313 | .206+00 | .186+00 | .186+02 | .206+02 | .277+00 | .735+00 |
| 2.2 | -.794 | -.802 | 1.398 | 1.406 | .161+00 | .158+00 | .250+02 | .255+02 | .225+00 | .776+00 |
| 2.4 | -.914 | -.873 | 1.527 | 1.486 | .122+00 | .134+00 | .337+02 | .306+02 | .181+00 | .832+00 |
| 2.6 | -1.054 | -.946 | 1.654 | 1.546 | .883-01 | .113+00 | .451+02 | .352+02 | .144+00 | .909+00 |
| 2.8 | -1.229 | -1.028 | 1.772 | 1.571 | .590-01 | .938-01 | .592+02 | .372+02 | .111+00 | .101+01 |
| 3.0 | -1.458 | -1.131 | 1.869 | 1.547 | .349-01 | .740-01 | .740+02 | .349+02 | .818-01 | .113+01 |
| 3.4 | -2.089 | -1.429 | 1.971 | 1.311 | .814-02 | .372-01 | .935+02 | .205+02 | .381-01 | .136+01 |
| 3.8 | -2.851 | -1.805 | 1.995 | .949 | .141-02 | .157-01 | .989+02 | .890+01 | .157-01 | .148+01 |
| 4.2 | -3.644 | -2.201 | 1.999 | .556 | .227-03 | .630-02 | .998+02 | .360+01 | .630-02 | .153+01 |
| 4.6 | -4.443 | -2.600 | 2.000 | .157 | .361-04 | .251-02 | .100+03 | .144+01 | .251-02 | .156+01 |
| 5.0 | -5.243 | -3.000 | 2.000 | -.243 | .572-05 | .100-02 | .100+03 | .572+00 | .100-02 | .157+01 |

EXACT ZIMM EIGENVALUES N=100 H*= .20

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .334-02 | .263+01 | .380+00 | .248+03 | 2.165 | .462 | .103+06 | 1.1496 | .245 | 2.509 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCT... ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .335 | -2.739 | -5.539 | -2.465 | .216+01 | .182-02 | .289-05 | .343-02 | .216+01 | .842-03 |
| -2.0 | .335 | -1.939 | -3.939 | -1.665 | .216+01 | .115-01 | .115-03 | .216-01 | .216+01 | .531-02 |
| -1.8 | .335 | -1.740 | -3.540 | -1.465 | .216+01 | .182-01 | .289-03 | .343-01 | .216+01 | .842-02 |
| -1.4 | .335 | -1.340 | -2.740 | -1.065 | .216+01 | .457-01 | .182-02 | .861-01 | .216+01 | .211-01 |
| -1.0 | .333 | -.943 | -1.943 | -.667 | .215+01 | .114+00 | .114-01 | .215+00 | .216+01 | .528-01 |
| -.8 | .330 | -.749 | -1.549 | -.470 | .214+01 | .178+00 | .283-01 | .339+00 | .215+01 | .831-01 |
| -.6 | .323 | -.563 | -1.163 | -.277 | .210+01 | .274+00 | .687-01 | .528+00 | .212+01 | .129+00 |
| -.4 | .306 | -.395 | -.795 | -.094 | .202+01 | .403+00 | .160+00 | .805+00 | .206+01 | .196+00 |
| -.2 | .271 | -.265 | -.455 | .071 | .187+01 | .543+00 | .343+00 | .118+01 | .194+01 | .283+00 |
| .0 | .213 | -.194 | -.194 | .213 | .163+01 | .640+00 | .640+00 | .163+01 | .175+01 | .374+00 |
| .2 | .138 | -.184 | .016 | .338 | .137+01 | .655+00 | .104+01 | .218+01 | .152+01 | .445+00 |
| .4 | .060 | -.211 | .189 | .460 | .115+01 | .615+00 | .154+01 | .289+01 | .130+01 | .491+00 |
| .6 | -.017 | -.254 | .346 | .583 | .961+00 | .557+00 | .222+01 | .383+01 | .111+01 | .525+00 |
| .8 | -.096 | -.305 | .495 | .704 | .802+00 | .496+00 | .313+01 | .506+01 | .943+00 | .554+00 |
| 1.0 | -.176 | -.361 | .639 | .824 | .666+00 | .436+00 | .436+01 | .666+01 | .796+00 | .579+00 |
| 1.2 | -.259 | -.421 | .779 | .941 | .551+00 | .380+00 | .602+01 | .874+01 | .669+00 | .603+00 |
| 1.4 | -.344 | -.483 | .917 | 1.056 | .453+00 | .329+00 | .826+01 | .114+02 | .560+00 | .628+00 |
| 1.6 | -.432 | -.547 | 1.053 | 1.168 | .370+00 | .284+00 | .113+02 | .147+02 | .466+00 | .655+00 |
| 1.8 | -.525 | -.611 | 1.189 | 1.275 | .298+00 | .245+00 | .155+02 | .188+02 | .386+00 | .688+00 |
| 2.0 | -.625 | -.674 | 1.326 | 1.375 | .237+00 | .212+00 | .212+02 | .237+02 | .318+00 | .729+00 |
| 2.2 | -.736 | -.738 | 1.462 | 1.464 | .184+00 | .183+00 | .290+02 | .291+02 | .259+00 | .783+00 |
| 2.4 | -.865 | -.802 | 1.598 | 1.535 | .137+00 | .158+00 | .396+02 | .343+02 | .209+00 | .857+00 |
| 2.6 | -1.024 | -.874 | 1.726 | 1.576 | .946-01 | .134+00 | .532+02 | .376+02 | .164+00 | .955+00 |
| 2.8 | -1.232 | -.964 | 1.836 | 1.568 | .586-01 | .109+00 | .685+02 | .370+02 | .123+00 | .108+01 |
| 3.0 | -1.502 | -1.085 | 1.915 | 1.498 | .315-01 | .821-01 | .821+02 | .315+02 | .880-01 | .120+01 |
| 3.4 | -2.193 | -1.417 | 1.983 | 1.207 | .641-02 | .383-01 | .962+02 | .161+02 | .388-01 | .140+01 |
| 3.8 | -2.972 | -1.803 | 1.997 | .828 | .107-02 | .157-01 | .994+02 | .674+01 | .158-01 | .150+01 |
| 4.2 | -3.768 | -2.200 | 2.000 | .432 | .171-03 | .630-02 | .999+02 | .270+01 | .631-02 | .154+01 |
| 4.6 | -4.567 | -2.600 | 2.000 | .033 | .271-04 | .251-02 | .100+03 | .108+01 | .251-02 | .156+01 |
| 5.0 | -5.367 | -3.000 | 2.000 | -.367 | .429-05 | .100-02 | .100+03 | .429+00 | .100-02 | .157+01 |

#1250

EXACT ZIMM EIGENVALUES

N=100 H*= .25

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .392-02 | .229+01 | .437+00 | .576+03 | 2.262 | .442 | .751+05 | 1.1573 | .226 | 2.790 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .354 | -2.737 | -5.537 | -2.446 | .226+01 | .183-02 | .291-05 | .358-02 | .226+01 | .811-03 |
| -2.0 | .354 | -1.937 | -3.937 | -1.646 | .226+01 | .116-01 | .116-03 | .226-01 | .226+01 | .512-02 |
| -1.8 | .354 | -1.737 | -3.537 | -1.446 | .226+01 | .183-01 | .291-03 | .358-01 | .226+01 | .811-02 |
| -1.4 | .354 | -1.337 | -2.737 | -1.046 | .226+01 | .460-01 | .183-02 | .900-01 | .226+01 | .204-01 |
| -1.0 | .352 | -.940 | -1.940 | -.648 | .225+01 | .115+00 | .115-01 | .225+00 | .225+01 | .509-01 |
| -.8 | .350 | -.746 | -1.546 | -.450 | .224+01 | .179+00 | .284-01 | .354+00 | .224+01 | .801-01 |
| -.6 | .342 | -.560 | -1.160 | -.258 | .220+01 | .276+00 | .692-01 | .553+00 | .222+01 | .125+00 |
| -.4 | .326 | -.392 | -.792 | -.074 | .212+01 | .406+00 | .161+00 | .844+00 | .216+01 | .183+00 |
| -.2 | .293 | -.261 | -.461 | .093 | .196+01 | .548+00 | .346+00 | .124+01 | .204+01 | .272+00 |
| .0 | .237 | -.189 | -.189 | .237 | .173+01 | .647+00 | .647+00 | .173+01 | .184+01 | .359+00 |
| .2 | .166 | -.177 | .023 | .366 | .147+01 | .665+00 | .105+01 | .232+01 | .161+01 | .426+00 |
| .4 | .093 | -.202 | .198 | .493 | .124+01 | .628+00 | .158+01 | .311+01 | .139+01 | .469+00 |
| .6 | .020 | -.242 | .358 | .620 | .105+01 | .573+00 | .228+01 | .416+01 | .119+01 | .501+00 |
| .8 | -.055 | -.288 | .512 | .745 | .882+00 | .515+00 | .325+01 | .556+01 | .102+01 | .529+00 |
| 1.0 | -.131 | -.340 | .660 | .869 | .740+00 | .457+00 | .457+01 | .740+01 | .870+00 | .553+00 |
| 1.2 | -.209 | -.395 | .805 | .991 | .618+00 | .403+00 | .638+01 | .979+01 | .738+00 | .578+00 |
| 1.4 | -.290 | -.451 | .949 | 1.110 | .512+00 | .354+00 | .889+01 | .129+02 | .623+00 | .604+00 |
| 1.6 | -.376 | -.508 | 1.092 | 1.224 | .421+00 | .311+00 | .124+02 | .168+02 | .523+00 | .636+00 |
| 1.8 | -.467 | -.564 | 1.236 | 1.333 | .341+00 | .273+00 | .172+02 | .215+02 | .437+00 | .675+00 |
| 2.0 | -.568 | -.619 | 1.381 | 1.432 | .271+00 | .241+00 | .241+02 | .271+02 | .362+00 | .727+00 |
| 2.2 | -.684 | -.674 | 1.526 | 1.516 | .207+00 | .212+00 | .336+02 | .328+02 | .296+00 | .797+00 |
| 2.4 | -.827 | -.734 | 1.666 | 1.573 | .149+00 | .184+00 | .463+02 | .374+02 | .237+00 | .891+00 |
| 2.6 | -1.012 | -.810 | 1.790 | 1.588 | .972-01 | .155+00 | .617+02 | .387+02 | .183+00 | .101+01 |
| 2.8 | -1.257 | -.914 | 1.886 | 1.543 | .553-01 | .122+00 | .769+02 | .349+02 | .134+00 | .114+01 |
| 3.0 | -1.565 | -1.055 | 1.945 | 1.435 | .273-01 | .882-01 | .882+02 | .273+02 | .923-01 | .127+01 |
| 3.4 | -2.297 | -1.410 | 1.990 | 1.103 | .505-02 | .389-01 | .978+02 | .127+02 | .392-01 | .144+01 |
| 3.8 | -3.085 | -1.802 | 1.998 | .715 | .823-03 | .158-01 | .996+02 | .519+01 | .158-01 | .152+01 |
| 4.2 | -3.883 | -2.200 | 2.000 | .317 | .131-03 | .631-02 | .999+02 | .208+01 | .631-02 | .155+01 |
| 4.6 | -4.682 | -2.600 | 2.000 | -.082 | .208-04 | .251-02 | .100+03 | .827+00 | .251-02 | .156+01 |
| 5.0 | -5.482 | -3.000 | 2.000 | -.482 | .329-05 | .100-02 | .100+03 | .329+00 | .100-02 | .157+01 |

EXACT ZIMM EIGENVALUES N=100 H*= .262

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIPROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .406-02 | .221+01 | .453+00 | .562+03 | 2.285 | .438 | .702+05 | 1.1589 | .222 | 2.852 |

REDUCED CYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MCD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .359 | -2.736 | -5.536 | -2.441 | .229+01 | .184-02 | .291-05 | .362-02 | .229+01 | .804-03 |
| -2.0 | .359 | -1.936 | -3.936 | -1.641 | .229+01 | .116-01 | .116-03 | .229-01 | .229+01 | .507-02 |
| -1.8 | .359 | -1.736 | -3.536 | -1.441 | .228+01 | .184-01 | .291-03 | .362-01 | .228+01 | .804-02 |
| -1.4 | .359 | -1.337 | -2.737 | -1.041 | .228+01 | .461-01 | .183-02 | .909-01 | .228+01 | .202-01 |
| -1.0 | .357 | -.940 | -1.940 | -.643 | .227+01 | .115+00 | .115-01 | .227+00 | .228+01 | .505-01 |
| -.8 | .354 | -.745 | -1.545 | -.446 | .226+01 | .180+00 | .285-01 | .358+00 | .227+01 | .794-01 |
| -.6 | .347 | -.559 | -1.159 | -.253 | .222+01 | .276+00 | .693-01 | .558+00 | .224+01 | .124+00 |
| -.4 | .331 | -.391 | -.791 | -.069 | .214+01 | .406+00 | .162+00 | .853+00 | .218+01 | .187+00 |
| -.2 | .298 | -.261 | -.461 | .098 | .199+01 | .549+00 | .346+00 | .125+01 | .206+01 | .270+00 |
| .0 | .243 | -.188 | -.188 | .243 | .175+01 | .649+00 | .649+00 | .175+01 | .187+01 | .355+00 |
| .2 | .173 | -.176 | .024 | .373 | .149+01 | .667+00 | .106+01 | .236+01 | .163+01 | .421+00 |
| .4 | .100 | -.200 | .200 | .500 | .126+01 | .631+00 | .158+01 | .317+01 | .141+01 | .464+00 |
| .6 | .028 | -.239 | .361 | .628 | .107+01 | .577+00 | .230+01 | .425+01 | .121+01 | .496+00 |
| .8 | -.045 | -.285 | .515 | .755 | .901+00 | .519+00 | .327+01 | .569+01 | .104+01 | .523+00 |
| 1.0 | -.120 | -.336 | .664 | .880 | .758+00 | .462+00 | .462+01 | .758+01 | .888+00 | .547+00 |
| 1.2 | -.198 | -.389 | .811 | 1.002 | .635+00 | .408+00 | .647+01 | .101+02 | .755+00 | .572+00 |
| 1.4 | -.278 | -.444 | .956 | 1.122 | .527+00 | .360+00 | .904+01 | .132+02 | .639+00 | .599+00 |
| 1.6 | -.362 | -.498 | 1.102 | 1.238 | .434+00 | .317+00 | .126+02 | .173+02 | .538+00 | .631+00 |
| 1.8 | -.453 | -.552 | 1.248 | 1.347 | .352+00 | .280+00 | .177+02 | .222+02 | .450+00 | .672+00 |
| 2.0 | -.554 | -.605 | 1.395 | 1.446 | .279+00 | .248+00 | .248+02 | .279+02 | .373+00 | .727+00 |
| 2.2 | -.672 | -.659 | 1.541 | 1.528 | .213+00 | .220+00 | .348+02 | .337+02 | .306+00 | .801+00 |
| 2.4 | -.819 | -.718 | 1.682 | 1.581 | .152+00 | .191+00 | .481+02 | .381+02 | .244+00 | .901+00 |
| 2.6 | -1.012 | -.795 | 1.805 | 1.588 | .972-01 | .160+00 | .638+02 | .387+02 | .187+00 | .103+01 |
| 2.8 | -1.267 | -.904 | 1.896 | 1.533 | .541-01 | .125+00 | .787+02 | .341+02 | .136+00 | .116+01 |
| 3.0 | -1.582 | -1.049 | 1.951 | 1.418 | .262-01 | .894-01 | .894+02 | .262+02 | .931-01 | .129+01 |
| 3.4 | -2.322 | -1.409 | 1.991 | 1.078 | .477-02 | .390-01 | .980+02 | .120+02 | .393-01 | .145+01 |
| 3.8 | -3.111 | -1.801 | 1.999 | .689 | .774-03 | .158-01 | .997+02 | .489+01 | .158-01 | .152+01 |
| 4.2 | -3.909 | -2.200 | 2.000 | .291 | .123-03 | .631-02 | .999+02 | .195+01 | .631-02 | .155+01 |
| 4.6 | -4.709 | -2.600 | 2.000 | -.109 | .195-04 | .251-02 | .100+03 | .778+00 | .251-02 | .156+01 |
| 5.0 | -5.509 | -3.000 | 2.000 | -.509 | .310-05 | .100-02 | .100+03 | .310+00 | .100-02 | .157+01 |

EXACT ZIMM EIGENVALUES N=100 H*= .30

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .450-02 | .195+01 | .514+00 | .524+03 | 2.360 | .424 | .574+05 | 1.1636 | .209 | 3.044 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .373 | -2.734 | -5.534 | -2.427 | .236+01 | .184-02 | .292-05 | .374-02 | .236+01 | .781-03 |
| -2.0 | .373 | -1.934 | -3.934 | -1.627 | .236+01 | .116-01 | .116-03 | .236-01 | .236+01 | .493-02 |
| -1.8 | .373 | -1.734 | -3.534 | -1.427 | .236+01 | .184-01 | .292-03 | .374-01 | .236+01 | .781-02 |
| -1.4 | .373 | -1.335 | -2.735 | -1.027 | .236+01 | .463-01 | .184-02 | .939-01 | .236+01 | .196-01 |
| -1.0 | .371 | -.938 | -1.938 | -.629 | .235+01 | .115+00 | .115-01 | .235+00 | .235+01 | .491-01 |
| -.8 | .368 | -.744 | -1.544 | -.432 | .233+01 | .180+00 | .286-01 | .370+00 | .234+01 | .772-01 |
| -.6 | .361 | -.557 | -1.157 | -.239 | .230+01 | .277+00 | .696-01 | .577+00 | .231+01 | .120+00 |
| -.4 | .346 | -.389 | -.789 | -.054 | .222+01 | .408+00 | .162+00 | .883+00 | .225+01 | .182+00 |
| -.2 | .314 | -.258 | -.458 | .114 | .206+01 | .552+00 | .348+00 | .130+01 | .213+01 | .262+00 |
| .0 | .261 | -.185 | -.185 | .261 | .182+01 | .653+00 | .653+00 | .182+01 | .194+01 | .344+00 |
| .2 | .194 | -.172 | .028 | .394 | .156+01 | .674+00 | .107+01 | .248+01 | .170+01 | .407+00 |
| .4 | .124 | -.194 | .206 | .524 | .133+01 | .639+00 | .161+01 | .334+01 | .148+01 | .448+00 |
| .6 | .055 | -.231 | .369 | .655 | .113+01 | .598+00 | .234+01 | .452+01 | .128+01 | .478+00 |
| .8 | -.015 | -.274 | .526 | .785 | .956+00 | .532+00 | .336+01 | .609+01 | .110+01 | .503+00 |
| 1.0 | -.087 | -.322 | .678 | .913 | .819+00 | .477+00 | .477+01 | .819+01 | .947+00 | .527+00 |
| 1.2 | -.161 | -.371 | .829 | 1.039 | .691+00 | .426+00 | .675+01 | .109+02 | .811+00 | .552+00 |
| 1.4 | -.238 | -.420 | .980 | 1.162 | .578+00 | .380+00 | .954+01 | .145+02 | .692+00 | .581+00 |
| 1.6 | -.320 | -.469 | 1.131 | 1.280 | .478+00 | .340+00 | .135+02 | .190+02 | .587+00 | .617+00 |
| 1.8 | -.410 | -.516 | 1.284 | 1.390 | .389+00 | .305+00 | .193+02 | .245+02 | .494+00 | .665+00 |
| 2.0 | -.513 | -.561 | 1.439 | 1.487 | .307+00 | .275+00 | .275+02 | .307+02 | .412+00 | .731+00 |
| 2.2 | -.638 | -.608 | 1.592 | 1.562 | .230+00 | .246+00 | .390+02 | .365+02 | .337+00 | .820+00 |
| 2.4 | -.801 | -.668 | 1.732 | 1.599 | .158+00 | .215+00 | .540+02 | .397+02 | .267+00 | .936+00 |
| 2.6 | -1.020 | -.753 | 1.847 | 1.580 | .956-01 | .177+00 | .703+02 | .381+02 | .201+00 | .107+01 |
| 2.8 | -1.303 | -.876 | 1.924 | 1.497 | .497-01 | .133+00 | .839+02 | .314+02 | .142+00 | .121+01 |
| 3.0 | -1.641 | -1.034 | 1.966 | 1.359 | .228-01 | .925-01 | .925+02 | .228+02 | .952-01 | .133+01 |
| 3.4 | -2.401 | -1.406 | 1.994 | .999 | .397-02 | .393-01 | .987+02 | .998+01 | .395-01 | .147+01 |
| 3.6 | 3.194 | -1.801 | 1.999 | .606 | .640-03 | .158-01 | .998+02 | .404+01 | .158-01 | .153+01 |
| 4.2 | -3.993 | -2.200 | 2.000 | .207 | .102-03 | .631-02 | .100+03 | .161+01 | .631-02 | .155+01 |
| 4.6 | -4.792 | -2.600 | 2.000 | -.192 | .161-04 | .251-02 | .100+03 | .642+00 | .251-02 | .156+01 |
| 5.0 | -5.592 | -3.000 | 2.000 | -.592 | .256-05 | .100-02 | .100+03 | .256+00 | .100-02 | .157+01 |

EXACT ZIMM EIGENVALUES N=200 H*= .05

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .479-03 | .366+01 | .273+00 | .390+04 | 1.866 | .536 | .487+07 | 1.1157 | .321 | 1.334 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .271 | -2.752 | -5.552 | -2.529 | .187+01 | .177-02 | .280-05 | .296-02 | .187+01 | .948-03 |
| -2.0 | .271 | -1.952 | -3.952 | -1.729 | .187+01 | .112-01 | .112-03 | .187-01 | .187+01 | .598-02 |
| -1.8 | .271 | -1.753 | -3.553 | -1.529 | .187+01 | .177-01 | .280-03 | .296-01 | .187+01 | .948-02 |
| -1.4 | .270 | -1.353 | -2.753 | -1.130 | .186+01 | .444-01 | .177-02 | .742-01 | .186+01 | .238-01 |
| -1.0 | .268 | -.956 | -1.956 | -.732 | .186+01 | .111+00 | .111-01 | .186+00 | .186+01 | .595-01 |
| -.8 | .265 | -.762 | -1.562 | -.535 | .184+01 | .173+00 | .274-01 | .292+00 | .185+01 | .937-01 |
| -.6 | .256 | -.576 | -1.176 | -.344 | .180+01 | .265+00 | .666-01 | .453+00 | .182+01 | .146+00 |
| -.4 | .237 | -.410 | -.810 | -.163 | .172+01 | .389+00 | .155+00 | .687+00 | .177+01 | .222+00 |
| -.2 | .196 | -.282 | -.482 | -.004 | .157+01 | .523+00 | .330+00 | .991+00 | .165+01 | .321+00 |
| .0 | .127 | -.215 | -.215 | .127 | .134+01 | .609+00 | .609+00 | .134+01 | .147+01 | .427+00 |
| .2 | .039 | -.214 | -.014 | .239 | .109+01 | .611+00 | .968+00 | .173+01 | .125+01 | .510+00 |
| .4 | -.053 | -.253 | .147 | .347 | .885+00 | .558+00 | .140+01 | .222+01 | .105+01 | .563+00 |
| .6 | -.144 | -.309 | .291 | .456 | .718+00 | .491+00 | .196+01 | .286+01 | .870+00 | .600+00 |
| .8 | -.235 | -.372 | .428 | .565 | .582+00 | .424+00 | .268+01 | .367+01 | .720+00 | .630+00 |
| 1.0 | -.327 | -.443 | .557 | .673 | .471+00 | .361+00 | .361+01 | .471+01 | .593+00 | .654+00 |
| 1.2 | -.421 | -.519 | .681 | .779 | .380+00 | .303+00 | .480+01 | .602+01 | .486+00 | .674+00 |
| 1.4 | -.515 | -.598 | .802 | .885 | .306+00 | .252+00 | .634+01 | .768+01 | .396+00 | .690+00 |
| 1.6 | -.610 | -.680 | .920 | .990 | .246+00 | .209+00 | .831+01 | .978+01 | .322+00 | .705+00 |
| 1.8 | -.705 | -.765 | 1.035 | 1.095 | .197+00 | .172+00 | .108+02 | .124+02 | .261+00 | .717+00 |
| 2.0 | -.802 | -.851 | 1.149 | 1.198 | .158+00 | .141+00 | .141+02 | .158+02 | .211+00 | .730+00 |
| 2.2 | -.901 | -.938 | 1.262 | 1.299 | .126+00 | .115+00 | .183+02 | .199+02 | .171+00 | .742+00 |
| 2.4 | -1.000 | -1.026 | 1.374 | 1.400 | .999-01 | .942-01 | .237+02 | .251+02 | .137+00 | .756+00 |
| 2.6 | -1.102 | -1.114 | 1.486 | 1.498 | .790-01 | .770-01 | .306+02 | .315+02 | .110+00 | .772+00 |
| 2.8 | -1.208 | -1.200 | 1.600 | 1.592 | .620-01 | .630-01 | .398+02 | .391+02 | .884-01 | .794+00 |
| 3.0 | -1.319 | -1.286 | 1.714 | 1.681 | .480-01 | .518-01 | .518+02 | .480+02 | .706-01 | .823+00 |
| 3.4 | -1.577 | -1.452 | 1.948 | 1.823 | .265-01 | .353-01 | .887+02 | .665+02 | .441-01 | .927+00 |
| 3.8 | -1.960 | -1.643 | 2.157 | 1.840 | .110-01 | .227-01 | .143+03 | .691+02 | .252-01 | .112+01 |
| 4.2 | -2.567 | -1.933 | 2.267 | 1.633 | .271-02 | .117-01 | .185+03 | .430+02 | .120-01 | .134+01 |
| 4.6 | -3.320 | -2.305 | 2.295 | 1.280 | .479-03 | .496-02 | .197+03 | .191+02 | .498-02 | .147+01 |
| 5.0 | -4.111 | -2.700 | 2.300 | .889 | .774-04 | .200-02 | .200+03 | .774+01 | .200-02 | .153+01 |

#1250

EXACT ZIMM EIGENVALUES N=200 H*= .075

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .594-03 | .349+01 | .287+00 | .327+04 | 1.941 | .515 | .319+07 | 1.1251 | .299 | 1.677 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .288 | -2.749 | -5.549 | -2.512 | .194+01 | .178-02 | .283-05 | .308-02 | .194+01 | .919-03 |
| -2.0 | .288 | -1.949 | -3.949 | -1.712 | .194+01 | .113-01 | .113-03 | .194-01 | .194+01 | .580-02 |
| -1.8 | .288 | -1.749 | -3.549 | -1.512 | .194+01 | .178-01 | .283-03 | .308-01 | .194+01 | .919-02 |
| -1.4 | .288 | -1.349 | -2.749 | -1.112 | .194+01 | .447-01 | .178-02 | .772-01 | .194+01 | .231-01 |
| -1.0 | .286 | -.953 | -1.953 | -.714 | .193+01 | .112+00 | .112-01 | .193+00 | .193+01 | .577-01 |
| -.8 | .282 | -.758 | -1.558 | -.518 | .192+01 | .174+00 | .276-01 | .304+00 | .192+01 | .908-01 |
| -.6 | .274 | -.573 | -1.173 | -.326 | .188+01 | .268+00 | .672-01 | .472+00 | .190+01 | .141+00 |
| -.4 | .255 | -.406 | -.806 | -.145 | .180+01 | .393+00 | .156+00 | .716+00 | .184+01 | .215+00 |
| -.2 | .216 | -.277 | -.477 | .016 | .164+01 | .528+00 | .333+00 | .104+01 | .173+01 | .311+00 |
| .0 | .150 | -.209 | -.209 | .150 | .141+01 | .618+00 | .618+00 | .141+01 | .154+01 | .412+00 |
| .2 | .066 | -.205 | -.005 | .266 | .116+01 | .623+00 | .988+00 | .184+01 | .132+01 | .492+00 |
| .4 | -.022 | -.241 | .159 | .378 | .950+00 | .574+00 | .144+01 | .239+01 | .111+01 | .543+00 |
| .6 | -.109 | -.293 | .307 | .491 | .777+00 | .509+00 | .203+01 | .309+01 | .929+00 | .580+00 |
| .8 | -.197 | -.354 | .446 | .603 | .635+00 | .443+00 | .280+01 | .401+01 | .774+00 | .609+00 |
| 1.0 | -.286 | -.421 | .579 | .714 | .517+00 | .380+00 | .380+01 | .517+01 | .641+00 | .633+00 |
| 1.2 | -.377 | -.493 | .707 | .823 | .470+00 | .322+00 | .510+01 | .666+01 | .529+00 | .653+00 |
| 1.4 | -.468 | -.569 | .831 | .932 | .340+00 | .270+00 | .678+01 | .855+01 | .434+00 | .671+00 |
| 1.6 | -.561 | -.647 | .953 | 1.039 | .275+00 | .225+00 | .897+01 | .109+02 | .355+00 | .686+00 |
| 1.8 | -.655 | -.728 | 1.072 | 1.145 | .221+00 | .187+00 | .118+02 | .140+02 | .290+00 | .701+00 |
| 2.0 | -.750 | -.811 | 1.189 | 1.250 | .178+00 | .155+00 | .155+02 | .178+02 | .236+00 | .715+00 |
| 2.2 | -.847 | -.895 | 1.305 | 1.353 | .142+00 | .127+00 | .202+02 | .225+02 | .191+00 | .730+00 |
| 2.4 | -.946 | -.979 | 1.421 | 1.454 | .113+00 | .105+00 | .264+02 | .284+02 | .154+00 | .747+00 |
| 2.6 | -1.048 | -1.063 | 1.537 | 1.552 | .895-01 | .865-01 | .344+02 | .356+02 | .124+00 | .768+00 |
| 2.8 | -1.155 | -1.146 | 1.654 | 1.645 | .699-01 | .715-01 | .451+02 | .441+02 | .100+00 | .796+00 |
| 3.0 | -1.270 | -1.227 | 1.773 | 1.730 | .537-01 | .592-01 | .592+02 | .537+02 | .799-01 | .834+00 |
| 3.4 | -1.551 | -1.391 | 2.009 | 1.849 | .281-01 | .407-01 | .102+03 | .707+02 | .495-01 | .966+00 |
| 3.8 | -1.993 | -1.601 | 2.199 | 1.807 | .102-01 | .251-01 | .158+03 | .642+02 | .271-01 | .119+01 |
| 4.2 | -2.656 | -1.920 | 2.280 | 1.544 | .221-02 | .120-01 | .190+03 | .350+02 | .122-01 | .139+01 |
| 4.6 | -3.426 | -2.303 | 2.297 | 1.174 | .375-03 | .498-02 | .198+03 | .149+02 | .500-02 | .150+01 |
| 5.0 | -4.222 | -2.700 | 2.300 | .778 | .600-04 | .200-02 | .200+03 | .600+01 | .200-02 | .154+01 |

EXACT ZIMM EIGENVALUES N=200 H*= .10

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JFR | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .710-03 | .332+01 | .302+00 | .283+04 | 2.006 | .499 | .225+07 | 1.1326 | .282 | 1.934 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .302 | -2.746 | -5.546 | -2.498 | .201+01 | .180-02 | .284-05 | .318-02 | .201+01 | .895-03 |
| -2.0 | .302 | -1.946 | -3.946 | -1.698 | .201+01 | .113-01 | .113-03 | .201-01 | .201+01 | .565-02 |
| -1.8 | .302 | -1.746 | -3.546 | -1.498 | .201+01 | .179-01 | .284-03 | .318-01 | .201+01 | .895-02 |
| -1.4 | .302 | -1.347 | -2.747 | -1.098 | .200+01 | .450-01 | .179-02 | .798-01 | .200+01 | .225-01 |
| -1.0 | .300 | -.950 | -1.950 | -.700 | .200+01 | .112+00 | .112-01 | .200+00 | .200+01 | .562-01 |
| -.8 | .297 | -.756 | -1.556 | -.503 | .198+01 | .176+00 | .278-01 | .314+00 | .199+01 | .884-01 |
| -.6 | .289 | -.570 | -1.170 | -.311 | .194+01 | .269+00 | .677-01 | .488+00 | .196+01 | .138+00 |
| -.4 | .270 | -.402 | -.802 | -.130 | .186+01 | .396+00 | .158+00 | .742+00 | .191+01 | .209+00 |
| -.2 | .233 | -.273 | -.473 | .033 | .171+01 | .533+00 | .336+00 | .108+01 | .179+01 | .302+00 |
| .0 | .169 | -.204 | -.204 | .169 | .148+01 | .625+00 | .625+00 | .148+01 | .160+01 | .400+00 |
| .2 | .088 | -.199 | .001 | .288 | .122+01 | .633+00 | .100+01 | .194+01 | .138+01 | .477+00 |
| .4 | .003 | -.232 | .168 | .403 | .101+01 | .586+00 | .147+01 | .253+01 | .116+01 | .527+00 |
| .6 | -.081 | -.281 | .319 | .519 | .830+00 | .523+00 | .208+01 | .330+01 | .981+00 | .563+00 |
| .8 | -.166 | -.339 | .461 | .634 | .682+00 | .458+00 | .289+01 | .430+01 | .822+00 | .592+00 |
| 1.0 | -.252 | -.403 | .597 | .748 | .559+00 | .395+00 | .395+01 | .559+01 | .685+00 | .615+00 |
| 1.2 | -.340 | -.472 | .728 | .860 | .457+00 | .337+00 | .534+01 | .724+01 | .568+00 | .636+00 |
| 1.4 | -.429 | -.545 | .855 | .971 | .372+00 | .285+00 | .716+01 | .935+01 | .469+00 | .654+00 |
| 1.6 | -.519 | -.620 | .980 | 1.081 | .302+00 | .240+00 | .954+01 | .120+02 | .386+00 | .670+00 |
| 1.8 | -.611 | -.698 | 1.102 | 1.189 | .245+00 | .200+00 | .126+02 | .154+02 | .316+00 | .686+00 |
| 2.0 | -.705 | -.778 | 1.222 | 1.295 | .197+00 | .167+00 | .167+02 | .197+02 | .258+00 | .702+00 |
| 2.2 | -.801 | -.858 | 1.342 | 1.399 | .158+00 | .139+00 | .220+02 | .251+02 | .210+00 | .720+00 |
| 2.4 | -.899 | -.939 | 1.461 | 1.501 | .126+00 | .115+00 | .289+02 | .317+02 | .171+00 | .740+00 |
| 2.6 | -1.002 | -1.019 | 1.581 | 1.598 | .995-01 | .957-01 | .381+02 | .396+02 | .138+00 | .766+00 |
| 2.8 | -1.111 | -1.098 | 1.702 | 1.689 | .774-01 | .798-01 | .503+02 | .489+02 | .111+00 | .800+00 |
| 3.0 | -1.230 | -1.176 | 1.824 | 1.770 | .588-01 | .667-01 | .667+02 | .588+02 | .889-01 | .848+00 |
| 3.4 | -1.538 | -1.339 | 2.061 | 1.862 | .230-01 | .458-01 | .115+03 | .729+02 | .542-01 | .101+01 |
| 3.8 | -2.036 | -1.572 | 2.228 | 1.764 | .921-02 | .268-01 | .169+03 | .581+02 | .283-01 | .124+01 |
| 4.2 | -2.738 | -1.913 | 2.287 | 1.462 | .183-02 | .122-01 | .194+03 | .290+02 | .124-01 | .142+01 |
| 4.6 | -3.519 | -2.301 | 2.299 | 1.081 | .303-03 | .500-02 | .199+03 | .120+02 | .501-02 | .151+01 |
| 5.0 | -4.316 | -2.699 | 2.301 | .684 | .483-04 | .200-02 | .200+03 | .483+01 | .200-02 | .155+01 |

#1250

EXACT ZIMM EIGENVALUES

N=200 H*= .130

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .849-03 | .311+01 | .322+00 | .244+04 | 2.074 | .482 | .158+07 | 1.1397 | .265 | 2.175 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .317 | -2.743 | -5.543 | -2.483 | .207+01 | .181-02 | .286-05 | .329-02 | .207+01 | .871-03 |
| -2.0 | .317 | -1.943 | -3.943 | -1.683 | .207+01 | .114-01 | .114-03 | .207-01 | .207+01 | .549-02 |
| -1.8 | .317 | -1.743 | -3.543 | -1.483 | .207+01 | .181-01 | .286-03 | .329-01 | .207+01 | .871-02 |
| -1.4 | .316 | -1.344 | -2.744 | -1.084 | .207+01 | .453-01 | .180-02 | .825-01 | .207+01 | .219-01 |
| -1.0 | .315 | -.947 | -1.947 | -.685 | .206+01 | .113+00 | .113-01 | .206+00 | .207+01 | .547-01 |
| -.8 | .311 | -.753 | -1.553 | -.489 | .205+01 | .177+00 | .280-01 | .325+00 | .206+01 | .860-01 |
| -.6 | .304 | -.567 | -1.167 | -.296 | .201+01 | .271+00 | .681-01 | .506+00 | .203+01 | .134+00 |
| -.4 | .286 | -.399 | -.799 | -.114 | .193+01 | .399+00 | .159+00 | .769+00 | .197+01 | .203+00 |
| -.2 | .250 | -.270 | -.470 | .050 | .178+01 | .537+00 | .339+00 | .112+01 | .186+01 | .294+00 |
| .0 | .188 | -.200 | -.200 | .188 | .154+01 | .631+00 | .631+00 | .154+01 | .167+01 | .388+00 |
| .2 | .110 | -.193 | .007 | .310 | .129+01 | .642+00 | .102+01 | .204+01 | .144+01 | .462+00 |
| .4 | .029 | -.223 | .177 | .429 | .107+01 | .598+00 | .150+01 | .268+01 | .122+01 | .510+00 |
| .6 | -.052 | -.270 | .330 | .548 | .896+00 | .537+00 | .214+01 | .353+01 | .104+01 | .545+00 |
| .8 | -.134 | -.325 | .475 | .666 | .734+00 | .473+00 | .299+01 | .463+01 | .873+00 | .573+00 |
| 1.0 | -.218 | -.386 | .614 | .782 | .606+00 | .411+00 | .411+01 | .606+01 | .732+00 | .596+00 |
| 1.2 | -.302 | -.452 | .748 | .898 | .499+00 | .353+00 | .560+01 | .790+01 | .611+00 | .616+00 |
| 1.4 | -.388 | -.522 | .878 | 1.012 | .409+00 | .301+00 | .756+01 | .103+02 | .508+00 | .634+00 |
| 1.6 | -.476 | -.594 | 1.006 | 1.124 | .334+00 | .255+00 | .101+02 | .133+02 | .420+00 | .652+00 |
| 1.8 | -.566 | -.668 | 1.132 | 1.234 | .272+00 | .215+00 | .136+02 | .172+02 | .347+00 | .669+00 |
| 2.0 | -.657 | -.743 | 1.257 | 1.343 | .220+00 | .181+00 | .181+02 | .220+02 | .285+00 | .687+00 |
| 2.2 | -.752 | -.819 | 1.381 | 1.448 | .177+00 | .152+00 | .240+02 | .281+02 | .233+00 | .708+00 |
| 2.4 | -.850 | -.896 | 1.504 | 1.550 | .141+00 | .127+00 | .319+02 | .355+02 | .190+00 | .733+00 |
| 2.6 | -.954 | -.971 | 1.629 | 1.646 | .111+00 | .107+00 | .425+02 | .443+02 | .154+00 | .765+00 |
| 2.8 | -1.066 | -1.046 | 1.754 | 1.734 | .860-01 | .899-01 | .567+02 | .543+02 | .124+00 | .808+00 |
| 3.0 | -1.192 | -1.120 | 1.880 | 1.808 | .643-01 | .758-01 | .758+02 | .643+02 | .994-01 | .867+00 |
| 3.4 | -1.535 | -1.288 | 2.112 | 1.865 | .291-01 | .516-01 | .130+03 | .732+02 | .592-01 | .106+01 |
| 3.8 | -2.095 | -1.548 | 2.252 | 1.705 | .804-02 | .283-01 | .178+03 | .507+02 | .294-01 | .129+01 |
| 4.2 | -2.829 | -1.908 | 2.292 | 1.371 | .148-02 | .124-01 | .196+03 | .235+02 | .125-01 | .145+01 |
| 4.6 | -3.617 | -2.300 | 2.300 | .983 | .241-03 | .501-02 | .199+03 | .961+01 | .501-02 | .152+01 |
| 5.0 | -4.415 | -2.699 | 2.301 | .585 | .384-04 | .200-02 | .200+03 | .384+01 | .200-02 | .155+01 |



#1250

EXACT ZIMM EIGENVALUES N=200 H*= .15

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .941-03 | .297+01 | .336+00 | .225+04 | 2.115 | .473 | .129+07 | 1.1435 | .256 | 2.308 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .325 | -2.742 | -5.542 | -2.475 | .212+01 | .181-02 | .287-05 | .335-02 | .212+01 | .857-03 |
| -2.0 | .325 | -1.942 | -3.942 | -1.675 | .212+01 | .114-01 | .114-03 | .212-01 | .212+01 | .541-02 |
| -1.8 | .325 | -1.742 | -3.542 | -1.475 | .211+01 | .181-01 | .287-03 | .335-01 | .212+01 | .857-02 |
| -1.4 | .325 | -1.342 | -2.742 | -1.075 | .211+01 | .455-01 | .181-02 | .841-01 | .211+01 | .215-01 |
| -1.0 | .323 | -.946 | -1.946 | -.677 | .210+01 | .113+00 | .113-01 | .210+00 | .211+01 | .538-01 |
| -.8 | .320 | -.751 | -1.551 | -.480 | .209+01 | .177+00 | .281-01 | .331+00 | .210+01 | .846-01 |
| -.6 | .313 | -.565 | -1.165 | -.287 | .205+01 | .272+00 | .684-01 | .516+00 | .207+01 | .132+00 |
| -.4 | .295 | -.398 | -.798 | -.105 | .197+01 | .400+00 | .159+00 | .785+00 | .201+01 | .200+00 |
| -.2 | .259 | -.268 | -.468 | .059 | .182+01 | .539+00 | .340+00 | .115+01 | .190+01 | .289+00 |
| .0 | .199 | -.198 | -.198 | .199 | .158+01 | .635+00 | .635+00 | .158+01 | .171+01 | .381+00 |
| .2 | .123 | -.189 | .011 | .323 | .133+01 | .647+00 | .103+01 | .210+01 | .148+01 | .454+00 |
| .4 | .043 | -.219 | .181 | .443 | .111+01 | .604+00 | .152+01 | .278+01 | .126+01 | .500+00 |
| .6 | -.036 | -.264 | .336 | .564 | .921+00 | .545+00 | .217+01 | .367+01 | .107+01 | .534+00 |
| .8 | -.116 | -.317 | .483 | .684 | .766+00 | .482+00 | .304+01 | .483+01 | .905+00 | .561+00 |
| 1.0 | -.197 | -.377 | .623 | .803 | .635+00 | .420+00 | .420+01 | .635+01 | .762+00 | .584+00 |
| 1.2 | -.280 | -.441 | .759 | .920 | .525+00 | .362+00 | .574+01 | .832+01 | .638+00 | .604+00 |
| 1.4 | -.364 | -.508 | .892 | 1.036 | .432+00 | .310+00 | .779+01 | .109+02 | .532+00 | .622+00 |
| 1.6 | -.450 | -.578 | 1.022 | 1.150 | .355+00 | .254+00 | .105+02 | .141+02 | .442+00 | .640+00 |
| 1.8 | -.538 | -.650 | 1.150 | 1.262 | .290+00 | .224+00 | .141+02 | .183+02 | .366+00 | .658+00 |
| 2.0 | -.629 | -.723 | 1.277 | 1.371 | .235+00 | .189+00 | .189+02 | .235+02 | .302+00 | .678+00 |
| 2.2 | -.722 | -.796 | 1.404 | 1.478 | .190+00 | .160+00 | .253+02 | .300+02 | .248+00 | .701+00 |
| 2.4 | -.820 | -.870 | 1.530 | 1.580 | .151+00 | .135+00 | .339+02 | .380+02 | .203+00 | .729+00 |
| 2.6 | -.924 | -.942 | 1.658 | 1.675 | .119+00 | .114+00 | .455+02 | .474+02 | .165+00 | .765+00 |
| 2.8 | -1.039 | -1.014 | 1.786 | 1.761 | .914-01 | .969-01 | .611+02 | .577+02 | .133+00 | .814+00 |
| 3.0 | -1.171 | -1.086 | 1.914 | 1.829 | .675-01 | .820-01 | .820+02 | .675+02 | .106+00 | .882+00 |
| 3.4 | -1.541 | -1.259 | 2.141 | 1.859 | .288-01 | .551-01 | .138+03 | .723+02 | .622-01 | .109+01 |
| 3.8 | -2.137 | -1.538 | 2.262 | 1.663 | .730-02 | .290-01 | .183+03 | .461+02 | .299-01 | .132+01 |
| 4.2 | -2.886 | -1.906 | 2.294 | 1.314 | .130-02 | .124-01 | .197+03 | .206+02 | .125-01 | .147+01 |
| 4.6 | -3.677 | -2.300 | 2.300 | .923 | .211-03 | .501-02 | .199+03 | .838+01 | .502-02 | .153+01 |
| 5.0 | -4.475 | -2.699 | 2.301 | .525 | .335-04 | .200-02 | .200+03 | .335+01 | .200-02 | .155+01 |

#1250

EXACT ZIMM EIGENVALUES N=200 H*= .20

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .117-02 | .263+01 | .380+00 | .189+04 | 2.208 | .453 | .841+06 | 1.1510 | .236 | 2.584 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .344 | -2.739 | -5.539 | -2.456 | .221+01 | .182-02 | .289-05 | .350-02 | .221+01 | .826-03 |
| -2.0 | .344 | -1.939 | -3.939 | -1.656 | .221+01 | .115-01 | .115-03 | .221-01 | .221+01 | .521-02 |
| -1.8 | .344 | -1.739 | -3.539 | -1.456 | .221+01 | .182-01 | .289-03 | .350-01 | .221+01 | .826-02 |
| -1.4 | .344 | -1.340 | -2.740 | -1.056 | .221+01 | .458-01 | .182-02 | .878-01 | .221+01 | .207-01 |
| -1.0 | .342 | -.943 | -1.943 | -.658 | .220+01 | .114+00 | .114-01 | .220+00 | .220+01 | .519-01 |
| -.8 | .339 | -.748 | -1.548 | -.461 | .218+01 | .178+00 | .283-01 | .346+00 | .219+01 | .816-01 |
| -.6 | .332 | -.562 | -1.162 | -.268 | .215+01 | .274+00 | .688-01 | .539+00 | .216+01 | .127+00 |
| -.4 | .315 | -.395 | -.795 | -.085 | .207+01 | .403+00 | .160+00 | .822+00 | .210+01 | .193+00 |
| -.2 | .281 | -.264 | -.464 | .081 | .191+01 | .544+00 | .343+00 | .120+01 | .199+01 | .278+00 |
| .0 | .224 | -.193 | -.193 | .224 | .167+01 | .641+00 | .641+00 | .167+01 | .179+01 | .366+00 |
| .2 | .151 | -.183 | .017 | .351 | .142+01 | .657+00 | .104+01 | .224+01 | .156+01 | .434+00 |
| .4 | .076 | -.210 | .190 | .476 | .119+01 | .617+00 | .155+01 | .299+01 | .134+01 | .478+00 |
| .6 | .001 | -.252 | .348 | .601 | .100+01 | .560+00 | .223+01 | .399+01 | .115+01 | .509+00 |
| .8 | -.075 | -.302 | .498 | .725 | .842+00 | .499+00 | .315+01 | .531+01 | .978+00 | .535+00 |
| 1.0 | -.152 | -.358 | .642 | .848 | .705+00 | .439+00 | .439+01 | .705+01 | .830+00 | .556+00 |
| 1.2 | -.230 | -.418 | .782 | .970 | .589+00 | .382+00 | .606+01 | .933+01 | .702+00 | .576+00 |
| 1.4 | -.310 | -.480 | .920 | 1.090 | .490+00 | .331+00 | .831+01 | .123+02 | .591+00 | .594+00 |
| 1.6 | -.392 | -.545 | 1.055 | 1.208 | .40[illegible]+00 | .285+00 | .114+02 | .162+02 | .496+00 | .612+00 |
| 1.8 | -.476 | -.611 | 1.189 | 1.324 | .334+00 | .245+00 | .155+02 | .211+02 | .414+00 | .633+00 |
| 2.0 | -.563 | -.677 | 1.323 | 1.437 | .273+00 | .210+00 | .210+02 | .273+02 | .345+00 | .656+00 |
| 2.2 | -.655 | -.743 | 1.457 | 1.545 | .221+00 | .181+00 | .286+02 | .351+02 | .286+00 | .684+00 |
| 2.4 | -.752 | -.809 | 1.591 | 1.648 | .177+00 | .155+00 | .390+02 | .444+02 | .235+00 | .721+00 |
| 2.6 | -.859 | -.873 | 1.727 | 1.741 | .138+00 | .134+00 | .533+02 | .550+02 | .192+00 | .769+00 |
| 2.8 | -.982 | -.938 | 1.862 | 1.818 | .104+00 | .115+00 | .728+02 | .658+02 | .155+00 | .836+00 |
| 3.0 | -1.131 | -1.007 | 1.993 | 1.869 | .739-01 | .983-01 | .983+02 | .739+02 | .123+00 | .926+00 |
| 3.4 | -1.575 | -1.203 | 2.197 | 1.825 | .266-01 | .627-01 | .157+03 | .668+02 | .681-01 | .117+01 |
| 3.8 | -2.244 | -1.520 | 2.230 | 1.556 | .571-02 | .302-01 | .190+03 | .360+02 | .307-01 | .138+01 |
| 4.2 | -3.016 | -1.903 | 2.297 | 1.184 | .964-03 | .125-01 | .198+03 | .153+02 | .126-01 | .149+01 |
| 4.6 | -3.811 | -2.300 | 2.3[illegible] | .789 | .154-03 | .502-02 | .200+03 | .615+01 | .502-02 | .154+01 |
| 5.0 | -4.611 | -2.699 | 2.3[illegible] | .389 | .245-04 | .200-02 | .200+03 | .245+01 | .200-02 | .156+01 |

EXACT ZIMM EIGENVALUES N=200 H*= .25

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .140-02 | .229+01 | .437+00 | .164+04 | 2.294 | .436 | .591+06 | 1.1565 | .220 | 2.806 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MC ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .361 | -2.737 | -5.537 | -2.439 | .229+01 | .183-02 | .291-05 | .364-02 | .229+01 | .799-03 |
| -2.0 | .361 | -1.937 | -3.537 | -1.639 | .229+01 | .116-01 | .116-03 | .229-01 | .229+01 | .504-02 |
| -1.8 | .361 | -1.737 | -3.537 | -1.439 | .229+01 | .183-01 | .290-03 | .364-01 | .229+01 | .799-02 |
| -1.4 | .360 | -1.337 | -2.737 | -1.040 | .229+01 | .460-01 | .183-02 | .913-01 | .229+01 | .201-01 |
| -1.0 | .359 | -.941 | -1.941 | -.641 | .228+01 | .115+00 | .115-01 | .228+00 | .229+01 | .502-01 |
| -.8 | .356 | -.746 | -1.546 | -.444 | .227+01 | .179+00 | .284-01 | .360+00 | .228+01 | .789-01 |
| -.6 | .349 | -.560 | -1.160 | -.251 | .223+01 | .275+00 | .692-01 | .561+00 | .225+01 | .123+00 |
| -.4 | .333 | -.392 | -.792 | -.067 | .215+01 | .405+00 | .161+00 | .856+00 | .219+01 | .186+00 |
| -.2 | .300 | -.262 | -.462 | .100 | .199+01 | .547+00 | .345+00 | .126+01 | .207+01 | .268+00 |
| .0 | .245 | -.189 | -.189 | .245 | .176+01 | .647+00 | .647+00 | .176+01 | .187+01 | .352+00 |
| .2 | .176 | -.178 | .022 | .376 | .150+01 | .664+00 | .105+01 | .238+01 | .164+01 | .417+00 |
| .4 | .104 | -.203 | .197 | .504 | .127+01 | .627+00 | .157+01 | .319+01 | .142+01 | .458+00 |
| .6 | .033 | -.243 | .357 | .673 | .108+01 | .572+00 | .228+01 | .430+01 | .122+01 | .487+00 |
| .8 | -.039 | -.290 | .510 | .761 | .915+00 | .512+00 | .323+01 | .577+01 | .105+01 | .511+00 |
| 1.0 | -.111 | -.343 | .657 | .889 | .774+00 | .454+00 | .454+01 | .774+01 | .897+00 | .531+00 |
| 1.2 | -.185 | -.399 | .801 | 1.015 | .653+00 | .399+00 | .632+01 | .103+02 | .765+00 | .549+00 |
| 1.4 | -.261 | -.457 | .943 | 1.139 | .548+00 | .349+00 | .876+01 | .138+02 | .650+00 | .567+00 |
| 1.6 | -.339 | -.517 | 1.083 | 1.261 | .459+00 | .304+00 | .121+02 | .183+02 | .550+00 | .586+00 |
| 1.8 | -.419 | -.57[illegible] | 1.224 | 1.381 | .381+00 | .265+00 | .167+02 | .240+02 | .464+00 | .608+00 |
| 2.0 | -.503 | -.635 | 1.354 | 1.497 | .314+00 | [illegible] | .231+02 | .314+02 | .390+00 | .635+00 |
| 2.2 | -.593 | -.694 | 1.506 | 1.607 | .255+00 | .202+00 | .321+02 | .405+02 | .326+00 | .670+00 |
| 2.4 | -.691 | -.751 | 1.649 | 1.709 | .204+00 | .178+00 | .446+02 | .512+02 | .270+00 | .717+00 |
| 2.6 | -.802 | -.806 | 1.794 | 1.798 | .158+00 | .156+00 | .622+02 | [illegible]28+02 | .222+00 | .780+00 |
| 2.8 | -.937 | -.865 | 1.935 | 1.863 | .116+00 | .136+00 | .860+02 | .729+02 | .179+00 | .867+00 |
| 3.0 | -1.110 | -.936 | 2.064 | 1.890 | .775-01 | .116+00 | .116+03 | .775+02 | .139+00 | .981+00 |
| 3.4 | -1.633 | -1.165 | 2.235 | 1.767 | .233-01 | .684-01 | .172+03 | .585+02 | .723-01 | .124+01 |
| 3.8 | -2.351 | -1.511 | 2.289 | 1.449 | .445-02 | .308-01 | .194+03 | .281+02 | .311-01 | .143+01 |
| 4.2 | -3.136 | -1.901 | 2.299 | 1.064 | .731-03 | .126-01 | .199+03 | .116+02 | .126-01 | .151+01 |
| 4.6 | -3.934 | -2.299 | 2.301 | .666 | .116-03 | .502-02 | .200+03 | .464+01 | .502-02 | .155+01 |
| 5.0 | -4.733 | -2.699 | 2.301 | .267 | .185-04 | .200-02 | .200+03 | .185+01 | .200-02 | .156+01 |

EXACT ZIMM EIGENVALUES N=200 H*= .262

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JFR | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .145-02 | .221+01 | .453+00 | .159+04 | 2.314 | .432 | .548+06 | 1.1578 | .216 | 2.855 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .364 | -2.736 | -5.536 | -2.436 | .231+01 | .183-02 | .291-05 | .367-02 | .231+01 | .793-03 |
| -2.0 | .364 | -1.936 | -3.936 | -1.636 | .231+01 | .116-01 | .116-03 | .231-01 | .231+01 | .500-02 |
| -1.8 | .364 | -1.736 | -3.536 | -1.436 | .231+01 | .183-01 | .291-03 | .367-01 | .231+01 | .793-02 |
| -1.4 | .364 | -1.337 | -2.737 | -1.036 | .231+01 | .460-01 | .183-02 | .921-01 | .231+01 | .199-01 |
| -1.0 | .362 | -.940 | -1.940 | -.638 | .230+01 | .115+00 | .115-01 | .230+00 | .231+01 | .498-01 |
| -.8 | .360 | -.746 | -1.546 | -.440 | .229+01 | .180+00 | .285-01 | .363+00 | .230+01 | .783-01 |
| -.6 | .353 | -.560 | -1.160 | -.247 | .225+01 | .276+00 | .693-01 | .566+00 | .227+01 | .122+00 |
| -.4 | .337 | -.392 | -.792 | -.063 | .217+01 | .406+00 | .162+00 | .864+00 | .221+01 | .185+00 |
| -.2 | .304 | -.261 | -.461 | .104 | .201+01 | .548+00 | .346+00 | .127+01 | .209+01 | .266+00 |
| .0 | .250 | -.189 | -.189 | .250 | .178+01 | .648+00 | .648+00 | .178+01 | .189+01 | .349+00 |
| .2 | .182 | -.177 | .023 | .382 | .152+01 | .666+00 | .105+01 | .241+01 | .166+01 | .413+00 |
| .4 | .111 | -.202 | .198 | .511 | .129+01 | .629+00 | .158+01 | .324+01 | .144+01 | .453+00 |
| .6 | .040 | -.241 | .359 | .640 | .110+01 | .574+00 | .229+01 | .437+01 | .124+01 | .482+00 |
| .8 | -.030 | -.288 | .512 | .770 | .932+00 | .515+00 | .325+01 | .588+01 | .107+01 | .505+00 |
| 1.0 | -.102 | -.340 | .660 | .898 | .790+00 | .457+00 | .457+01 | .790+01 | .913+00 | .524+00 |
| 1.2 | -.175 | -.395 | .805 | 1.025 | .658+00 | .403+00 | .638+01 | .106+02 | .780+00 | .542+00 |
| 1.4 | -.250 | -.452 | .948 | 1.150 | .563+00 | .353+00 | .887+01 | .141+02 | .664+00 | .560+00 |
| 1.6 | -.326 | -.510 | 1.030 | 1.274 | .472+00 | .309+00 | .123+02 | .188+02 | .564+00 | .579+00 |
| 1.8 | -.406 | -.569 | 1.231 | 1.394 | .393+00 | .270+00 | .170+02 | .248+02 | .477+00 | .602+00 |
| 2.0 | -.489 | -.626 | 1.374 | 1.511 | .324+00 | .237+00 | .237+02 | .324+02 | .401+00 | .630+00 |
| 2.2 | -.578 | -.682 | 1.518 | 1.622 | .264+00 | .208+00 | .330+02 | .419+02 | .336+00 | .667+00 |
| 2.4 | -.676 | -.737 | 1.663 | 1.724 | .211+00 | .183+00 | .461+02 | .529+02 | .279+00 | .716+00 |
| 2.6 | -.789 | -.790 | 1.810 | 1.811 | .162+00 | .162+00 | .645+02 | .646+02 | .229+00 | .784+00 |
| 2.8 | -.928 | -.848 | 1.952 | 1.872 | .118+00 | .142+00 | .895+02 | .745+02 | .184+00 | .877+00 |
| 3.0 | -1.108 | -.921 | 2.079 | 1.892 | .779-01 | .120+00 | .120+03 | .779+02 | .143+00 | .995+00 |
| 3.4 | -1.650 | -1.158 | 2.242 | 1.750 | .224-01 | .695-01 | .175+03 | .563+02 | .731-01 | .126+01 |
| 3.8 | -2.377 | -1.510 | 2.290 | 1.423 | .419-02 | .309-01 | .195+03 | .265+02 | .312-01 | .144+01 |
| 4.2 | -3.164 | -1.901 | 2.299 | 1.036 | .685-03 | .126-01 | .199+03 | .109+02 | .126-01 | .152+01 |
| 4.6 | -3.962 | -2.299 | 2.301 | .638 | .109-03 | .502-02 | .200+03 | .435+01 | .502-02 | .155+01 |
| 5.0 | -4.762 | -2.699 | 2.301 | .238 | .173-04 | .200-02 | .200+03 | .173+01 | .200-02 | .156+01 |



#1250

EXACT ZIMM EIGENVALUES N=200 H*= .30

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .163-02 | .195+01 | .514+00 | .146+04 | 2.377 | .421 | .439+06 | 1.1609 | .205 | 3.002 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .376 | -2.735 | -5.535 | -2.424 | .238+01 | .184-02 | .292-05 | .377-02 | .238+01 | .774-03 |
| -2.0 | .376 | -1.935 | -3.935 | -1.624 | .238+01 | .116-01 | .116-03 | .238-01 | .238+01 | .488-02 |
| -1.8 | .376 | -1.735 | -3.535 | -1.424 | .238+01 | .184-01 | .292-03 | .377-01 | .238+01 | .774-02 |
| -1.4 | .376 | -1.336 | -2.736 | -1.024 | .238+01 | .462-01 | .184-02 | .946-01 | .238+01 | .194-01 |
| -1.0 | .374 | -.939 | -1.939 | -.626 | .237+01 | .115+00 | .115-01 | .237+00 | .237+01 | .486-01 |
| -.8 | .371 | -.745 | -1.545 | -.429 | .235+01 | .180+00 | .285-01 | .373+00 | .236+01 | .764-01 |
| -.6 | .365 | -.558 | -1.158 | -.235 | .232+01 | .277+00 | .695-01 | .582+00 | .233+01 | .119+00 |
| -.4 | .349 | -.390 | -.790 | -.051 | .223+01 | .407+00 | .162+00 | .890+00 | .227+01 | .180+00 |
| -.2 | .318 | -.260 | -.460 | .118 | .208+01 | .550+00 | .347+00 | .131+01 | .215+01 | .259+00 |
| .0 | .265 | -.187 | -.187 | .265 | .184+01 | .651+00 | .651+00 | .184+01 | .195+01 | .340+00 |
| .2 | .199 | -.174 | .026 | .399 | .158+01 | .670+00 | .106+01 | .250+01 | .172+01 | .401+00 |
| .4 | .130 | -.198 | .202 | .530 | .135+01 | .634+00 | .159+01 | .339+01 | .149+01 | .439+00 |
| .6 | .063 | -.236 | .364 | .663 | .116+01 | .581+00 | .231+01 | .460+01 | .129+01 | .466+00 |
| .8 | -.005 | -.281 | .519 | .795 | .989+00 | .524+00 | .330+01 | .624+01 | .112+01 | .487+00 |
| 1.0 | -.074 | -.331 | .669 | .926 | .844+00 | .467+00 | .467+01 | .844+01 | .965+00 | .505+00 |
| 1.2 | -.143 | -.383 | .817 | 1.057 | .719+00 | .414+00 | .656+01 | .114+02 | .829+00 | .522+00 |
| 1.4 | -.215 | -.437 | .963 | 1.185 | .610+00 | .365+00 | .918+01 | .153+02 | .711+00 | .539+00 |
| 1.6 | -.288 | -.491 | 1.109 | 1.312 | .515+00 | .323+00 | .128+02 | .205+02 | .608+00 | .559+00 |
| 1.8 | -.364 | -.545 | 1.255 | 1.435 | .432+00 | .285+00 | .180+02 | .273+02 | .518+00 | .584+00 |
| 2.0 | -.445 | -.596 | 1.404 | 1.555 | .359+00 | .254+00 | .254+02 | .359+02 | .439+00 | .615+00 |
| 2.2 | -.533 | -.645 | 1.555 | 1.667 | .293+00 | .227+00 | .359+02 | .465+02 | .371+00 | .658+00 |
| 2.4 | -.632 | -.691 | 1.709 | 1.768 | .233+00 | .204+00 | .511+02 | .586+02 | .310+00 | .718+00 |
| 2.6 | -.751 | -.739 | 1.861 | 1.849 | .177+00 | .183+00 | .727+02 | .706+02 | .254+00 | .800+00 |
| 2.8 | -.904 | -.795 | 2.005 | 1.896 | .125+00 | .160+00 | .101+03 | .786+02 | .203+00 | .910+00 |
| 3.0 | -1.110 | -.874 | 2.126 | 1.890 | .777-01 | .134+00 | .134+03 | .777+02 | .155+00 | .104+01 |
| 3.4 | -1.708 | -1.140 | 2.260 | 1.692 | .196-01 | .725-01 | .182+03 | .492+02 | .751-01 | .131+01 |
| 3.8 | -2.459 | -1.506 | 2.294 | 1.341 | .348-02 | .312-01 | .197+03 | .219+02 | .314-01 | .146+01 |
| 4.2 | -3.251 | -1.900 | 2.300 | 949 | .562-03 | .126-01 | .199+03 | .890+01 | .126-01 | .153+01 |
| 4.6 | -4.049 | -2.299 | 2.301 | .551 | .893-04 | .502-02 | .200+03 | .355+01 | .502-02 | .155+01 |
| 5.0 | -4.849 | -2.699 | 2.301 | .151 | .142-04 | .200-02 | .200+03 | .142+01 | .200-02 | .156+01 |

EXACT ZIMM EIGENVALUES  N=300 H*= .05

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JFR | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .240-03 | .366+01 | .273+00 | .786+04 | 1.888 | .530 | .194+08 | 1.1178 | .314 | 1.465 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .276 | -2.752 | -5.552 | -2.524 | .189+01 | .177-02 | .281-05 | .299-02 | .189+01 | .938-03 |
| -2.0 | .276 | -1.952 | -3.952 | -1.724 | .189+01 | .112-01 | .112-03 | .189-01 | .189+01 | .592-02 |
| -1.8 | .276 | -1.752 | -3.552 | -1.524 | .189+01 | .177-01 | .281-03 | .299-01 | .189+01 | .938-02 |
| -1.4 | .276 | -1.352 | -2.752 | -1.124 | .189+01 | .444-01 | .177-02 | .751-01 | .189+01 | .236-01 |
| -1.0 | .274 | -.956 | -1.956 | -.726 | .188+01 | .111+00 | .111-01 | .188+00 | .189+01 | .589-01 |
| -.8 | .270 | -.761 | -1.561 | -.530 | .186+01 | .173+00 | .275-01 | .295+00 | .187+01 | .927-01 |
| -.6 | .262 | -.576 | -1.176 | -.338 | .183+01 | .266+00 | .668-01 | .459+00 | .185+01 | .144+00 |
| -.4 | .242 | -.409 | -.809 | -.158 | .175+01 | .390+00 | .155+00 | .696+00 | .179+01 | .220+00 |
| -.2 | .202 | -.281 | -.451 | .002 | .159+01 | .524+00 | .331+00 | .101+01 | .168+01 | .318+00 |
| .0 | .134 | -.214 | -.214 | .134 | .136+01 | .611+00 | .611+00 | .136+01 | .149+01 | .422+00 |
| .2 | .047 | -.212 | -.012 | .247 | .111+01 | .614+00 | .973+00 | .177+01 | .127+01 | .503+00 |
| .4 | -.043 | -.250 | .150 | .357 | .905+00 | .562+00 | .141+01 | .227+01 | .107+01 | .556+00 |
| .6 | -.132 | -.304 | .296 | .468 | .737+00 | .496+00 | .197+01 | .293+01 | .889+00 | .592+00 |
| .8 | -.222 | -.367 | .433 | .578 | .599+00 | .429+00 | .271+01 | .378+01 | .737+00 | .622+00 |
| 1.0 | -.313 | -.437 | .553 | .687 | .486+00 | .366+00 | .366+01 | .486+01 | .609+00 | .645+00 |
| 1.2 | -.405 | -.511 | .689 | .795 | .393+00 | .308+00 | .489+01 | .624+01 | .500+00 | .665+00 |
| 1.4 | -.498 | -.589 | .811 | .902 | .318+00 | .258+00 | .647+01 | .799+01 | .409+00 | .681+00 |
| 1.6 | -.592 | -.670 | .930 | 1.008 | .256+00 | .214+00 | .850+01 | .102+02 | .333+00 | .695+00 |
| 1.8 | -.686 | -.754 | 1.046 | 1.114 | .206+00 | .176+00 | .111+02 | .130+02 | .271+00 | .708+00 |
| 2.0 | -.782 | -.840 | 1.150 | 1.218 | .165+00 | .145+00 | .145+02 | .165+02 | .220+00 | .719+00 |
| 2.2 | -.878 | -.927 | 1.273 | 1.322 | .132+00 | .118+00 | .188+02 | .210+02 | .178+00 | .730+00 |
| 2.4 | -.976 | -1.015 | 1.385 | 1.424 | .106+00 | .967-01 | .243+02 | .266+02 | .143+00 | .741+00 |
| 2.6 | -1.074 | -1.103 | 1.497 | 1.526 | .842-01 | .789-01 | .314+02 | .335+02 | .115+00 | .753+00 |
| 2.8 | -1.175 | -1.192 | 1.608 | 1.625 | .658-01 | .643-01 | .406+02 | .421+02 | .927-01 | .767+00 |
| 3.0 | -1.279 | -1.260 | 1.720 | 1.721 | .526-01 | .525-01 | .525+02 | .526+02 | .744-01 | .784+00 |
| 3.4 | -1.502 | -1.451 | 1.949 | 1.898 | .315-01 | .354-01 | .890+02 | .791+02 | .474-01 | .844+00 |
| 3.8 | -1.780 | -1.619 | 2.181 | 2.020 | .166-01 | .241-01 | .152+03 | .105+03 | .292-01 | .968+00 |
| 4.2 | -2.215 | -1.829 | 2.371 | 1.985 | .610-02 | .148-01 | .235+03 | .967+02 | .160-01 | .118+01 |
| 4.6 | -2.871 | -2.145 | 2.455 | 1.729 | .134-02 | .716-02 | .285+03 | .535+02 | .728-02 | .139+01 |
| 5.0 | -3.640 | -2.527 | 2.473 | 1.360 | .229-03 | .297-02 | .297+03 | .229+02 | .298-02 | .149+01 |



#1250

EXACT ZIMM EIGENVALUES N=300 H*= .075

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .306-03 | .349+01 | .287+00 | .644+04 | 1.967 | .508 | .121+08 | 1.1273 | .291 | 1.798 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .294 | -2.748 | -5.548 | -2.506 | .197+01 | .179-02 | .283-05 | .312-02 | .197+01 | .908-03 |
| -2.0 | .294 | -1.948 | -3.948 | -1.706 | .197+01 | .113-01 | .113-03 | .197-01 | .197+01 | .573-02 |
| -1.8 | .294 | -1.748 | -3.548 | -1.506 | .197+01 | .179-01 | .283-03 | .312-01 | .197+01 | .908-02 |
| -1.4 | .293 | -1.349 | -2.749 | -1.107 | .197+01 | .448-01 | .178-02 | .782-01 | .197+01 | .228-01 |
| -1.0 | .292 | -.952 | -1.952 | -.708 | .196+01 | .112+00 | .112-01 | .196+00 | .196+01 | .570-01 |
| -.8 | .288 | -.758 | -1.558 | -.512 | .194+01 | .175+00 | .277-01 | .308+00 | .195+01 | .898-01 |
| -.6 | .280 | -.572 | -1.172 | -.320 | .191+01 | .268+00 | .674-01 | .479+00 | .192+01 | .140+00 |
| -.4 | .261 | -.405 | -.805 | -.139 | .183+01 | .394+00 | .157+00 | .727+00 | .187+01 | .213+00 |
| -.2 | .223 | -.276 | -.476 | .023 | .167+01 | .530+00 | .334+00 | .105+01 | .175+01 | .307+00 |
| .0 | .158 | -.208 | -.208 | .158 | .144+01 | .620+00 | .620+00 | .144+01 | .157+01 | .407+00 |
| .2 | .075 | -.203 | -.003 | .275 | .119+01 | .626+00 | .992+00 | .138+01 | .134+01 | .485+00 |
| .4 | -.012 | -.238 | .162 | .388 | .974+00 | .578+00 | .145+01 | .245+01 | .113+01 | .535+00 |
| .6 | -.097 | -.289 | .311 | .503 | .800+00 | .514+00 | .205+01 | .318+01 | .951+00 | .571+00 |
| .8 | -.183 | -.348 | .452 | .617 | .655+00 | .448+00 | .283+01 | .414+01 | .794+00 | .600+00 |
| 1.0 | -.271 | -.414 | .586 | .729 | .536+00 | .385+00 | .385+01 | .536+01 | .660+00 | .623+00 |
| 1.2 | -.360 | -.485 | .715 | .847 | .437+00 | .327+00 | .519+01 | .692+01 | .546+00 | .643+00 |
| 1.4 | -.450 | -.560 | .840 | .950 | .355+00 | .276+00 | .692+01 | .892+01 | .450+00 | .660+00 |
| 1.6 | -.541 | -.637 | .963 | 1.059 | .288+00 | .231+00 | .918+01 | .115+02 | .369+00 | .675+00 |
| 1.8 | -.633 | -.717 | 1.083 | 1.167 | .233+00 | .192+00 | .121+02 | .147+02 | .302+00 | .689+00 |
| 2.0 | -.726 | -.799 | 1.201 | 1.274 | .188+00 | .159+00 | .159+02 | .188+02 | .246+00 | .701+00 |
| 2.2 | -.821 | -.883 | 1.317 | 1.379 | .151+00 | .131+00 | .208+02 | .240+02 | .200+00 | .714+00 |
| 2.4 | -.917 | -.967 | 1.433 | 1.493 | .121+00 | .108+00 | .271+02 | .304+02 | .162+00 | .728+00 |
| 2.6 | -1.015 | -1.052 | 1.548 | 1.585 | .966-01 | .887-01 | .353+02 | .385+02 | .131+00 | .743+00 |
| 2.8 | -1.116 | -1.137 | 1.663 | 1.684 | .766-01 | .730-01 | .460+02 | .483+02 | .106+00 | .761+00 |
| 3.0 | -1.220 | -1.221 | 1.779 | 1.780 | .602-01 | .601-01 | .601+02 | .602+02 | .851-01 | .785+00 |
| 3.4 | -1.452 | -1.384 | 2.016 | 1.948 | .353-01 | .413-01 | .104+03 | .886+02 | .543-01 | .863+00 |
| 3.8 | -1.765 | -1.553 | 2.247 | 2.035 | .172-01 | .280-01 | .177+03 | .108+03 | .328-01 | .102+01 |
| 4.2 | -2.270 | -1.792 | 2.408 | 1.930 | .536-02 | .162-01 | .256+03 | .850+02 | .170-01 | .125+01 |
| 4.6 | -2.977 | -2.136 | 2.464 | 1.623 | .105-02 | .731-02 | .291+03 | .420+02 | .739-02 | .143+01 |
| 5.0 | -3.759 | -2.525 | 2.475 | 1.241 | .174-03 | .299-02 | .299+03 | .174+02 | .299-02 | .151+01 |

#1250

EXACT ZIMM EIGENVALUES N=300 H*= .10

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .372-03 | .332+01 | .302+00 | .547+04 | 2.034 | .492 | .821+07 | 1.1349 | .274 | 2.038 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .308 | -2.745 | -5.545 | -2.492 | .203+01 | .180-02 | .285-05 | .322-02 | .203+01 | .884-03 |
| -2.0 | .308 | -1.945 | -3.945 | -1.692 | .203+01 | .113-01 | .113-03 | .203-01 | .203+01 | .558-02 |
| -1.8 | .308 | -1.745 | -3.545 | -1.492 | .203+01 | .180-01 | .285-03 | .322-01 | .203+01 | .884-02 |
| -1.4 | .308 | -1.346 | -2.746 | -1.092 | .203+01 | .451-01 | .180-02 | .809-01 | .203+01 | .222-01 |
| -1.0 | .306 | -.949 | -1.949 | -.694 | .202+01 | .112+00 | .112-01 | .202+00 | .203+01 | .555-01 |
| -.8 | .303 | -.755 | -1.555 | -.497 | .201+01 | .176+00 | .279-01 | .318+00 | .202+01 | .874-01 |
| -.6 | .295 | -.569 | -1.169 | -.305 | .197+01 | .270+00 | .678-01 | .495+00 | .199+01 | .136+00 |
| -.4 | .277 | -.401 | -.801 | -.123 | .189+01 | .397+00 | .158+00 | .753+00 | .193+01 | .207+00 |
| -.2 | .240 | -.272 | -.472 | .040 | .174+01 | .534+00 | .337+00 | .110+01 | .182+01 | .298+00 |
| .0 | .177 | -.203 | -.203 | .177 | .150+01 | .627+00 | .627+00 | .150+01 | .163+01 | .395+00 |
| .2 | .097 | -.197 | .003 | .297 | .125+01 | .636+00 | .101+01 | .198+01 | .140+01 | .470+00 |
| .4 | .014 | -.229 | .171 | .414 | .103+01 | .590+00 | .148+01 | .259+01 | .119+01 | .519+00 |
| .6 | -.069 | -.277 | .323 | .531 | .854+00 | .528+00 | .210+01 | .340+01 | .100+01 | .554+00 |
| .8 | -.152 | -.334 | .456 | .648 | .705+00 | .464+00 | .292+01 | .445+01 | .844+00 | .582+00 |
| 1.0 | -.237 | -.397 | .603 | .763 | .580+00 | .401+00 | .401+01 | .580+01 | .705+00 | .605+00 |
| 1.2 | -.322 | -.465 | .735 | .878 | .476+00 | .343+00 | .544+01 | .754+01 | .587+00 | .624+00 |
| 1.4 | -.410 | -.536 | .864 | .990 | .389+00 | .291+00 | .731+01 | .978+01 | .486+00 | .642+00 |
| 1.6 | -.498 | -.611 | .989 | 1.102 | .318+00 | .245+00 | .975+01 | .126+02 | .401+00 | .657+00 |
| 1.8 | -.588 | -.688 | 1.112 | 1.212 | .258+00 | .205+00 | .129+02 | .163+02 | .330+00 | .671+00 |
| 2.0 | -.679 | -.766 | 1.234 | 1.321 | .209+00 | .171+00 | .171+02 | .209+02 | .270+00 | .686+00 |
| 2.2 | -.772 | -.847 | 1.353 | 1.428 | .169+00 | .142+00 | .226+02 | .268+02 | .221+00 | .700+00 |
| 2.4 | -.867 | -.928 | 1.472 | 1.533 | .136+00 | .118+00 | .297+02 | .341+02 | .180+00 | .716+00 |
| 2.6 | -.964 | -1.009 | 1.591 | 1.636 | .109+00 | .979-01 | .390+02 | .432+02 | .146+00 | .734+00 |
| 2.8 | -1.065 | -1.090 | 1.710 | 1.735 | .861-01 | .813-01 | .513+02 | .543+02 | .118+00 | .757+00 |
| 3.0 | -1.171 | -1.170 | 1.830 | 1.829 | .674-01 | .676-01 | .676+02 | .674+02 | .954-01 | .787+00 |
| 3.4 | -1.415 | -1.327 | 2.073 | 1.985 | .385-01 | .471-01 | .118+03 | .967+02 | .608-01 | .886+00 |
| 3.8 | -1.766 | -1.502 | 2.298 | 2.034 | .172-01 | .315-01 | .199+03 | .108+03 | .359-01 | .107+01 |
| 4.2 | -2.334 | -1.763 | 2.431 | 1.866 | .464-02 | .170-01 | .270+03 | .735+02 | .176-01 | .130+01 |
| 4.6 | -3.072 | -2.131 | 2.469 | 1.528 | .848-03 | .739-02 | .294+03 | .338+02 | .744-02 | .146+01 |
| 5.0 | -3.861 | -2.524 | 2.476 | 1.139 | .138-03 | .299-02 | .299+03 | .138+02 | .299-02 | .152+01 |

EXACT ZIMM EIGENVALUES N=300 H*= .130

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .451-03 | .311+01 | .322+00 | .466+04 | 2.102 | .476 | .561+07 | 1.1417 | .258 | 2.258 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETAIR | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .323 | -2.742 | -5.542 | -2.477 | .210+01 | .181-02 | .287-05 | .333-02 | .210+01 | .861-03 |
| -2.0 | .323 | -1.942 | -3.942 | -1.677 | .210+01 | .114-01 | .114-03 | .210-01 | .210+01 | .543-02 |
| -1.8 | .323 | -1.743 | -3.543 | -1.477 | .210+01 | .181-01 | .287-03 | .333-01 | .210+01 | .861-02 |
| -1.4 | .322 | -1.343 | -2.743 | -1.078 | .210+01 | .454-01 | .181-02 | .836-01 | .210+01 | .216-01 |
| -1.0 | .321 | -.946 | -1.946 | -.679 | .209+01 | .113+00 | .113-01 | .209+00 | .209+01 | .541-01 |
| -.8 | .317 | -.752 | -1.552 | -.483 | .208+01 | .177+00 | .281-01 | .329+00 | .208+01 | .850-01 |
| -.6 | .310 | -.566 | -1.166 | -.290 | .204+01 | .272+00 | .683-01 | .513+00 | .206+01 | .132+00 |
| -.4 | .292 | -.399 | -.799 | -.108 | .196+01 | .399+00 | .159+00 | .780+00 | .200+01 | .201+00 |
| -.2 | .256 | -.269 | -.469 | .056 | .180+01 | .538+00 | .340+00 | .114+01 | .188+01 | .290+00 |
| .0 | .196 | -.199 | -.199 | .196 | .157+01 | .633+00 | .633+00 | .157+01 | .169+01 | .383+00 |
| .2 | .119 | -.191 | .009 | .319 | .131+01 | .645+00 | .102+01 | .208+01 | .146+01 | .456+00 |
| .4 | .039 | -.221 | .179 | .439 | .109+01 | .601+00 | .151+01 | .275+01 | .125+01 | .503+00 |
| .6 | -.041 | -.267 | .333 | .559 | .911+00 | .541+00 | .215+01 | .363+01 | .106+01 | .536+00 |
| .8 | -.121 | -.321 | .479 | .679 | .757+00 | .478+00 | .301+01 | .478+01 | .895+00 | .563+00 |
| 1.0 | -.202 | -.381 | .619 | .798 | .627+00 | .416+00 | .416+01 | .627+01 | .753+00 | .595+00 |
| 1.2 | -.285 | -.446 | .754 | .915 | .518+00 | .358+00 | .568+01 | .822+01 | .630+00 | .604+00 |
| 1.4 | -.369 | -.514 | .886 | 1.031 | .427+00 | .306+00 | .768+01 | .107+02 | .525+00 | .621+00 |
| 1.6 | -.455 | -.586 | 1.014 | 1.145 | .351+00 | .260+00 | .103+02 | .140+02 | .436+00 | .637+00 |
| 1.8 | -.542 | -.659 | 1.141 | 1.258 | .287+00 | .219+00 | .138+02 | .181+02 | .361+00 | .652+00 |
| 2.0 | -.631 | -.734 | 1.266 | 1.369 | .234+00 | .184+00 | .184+02 | .234+02 | .298+00 | .668+00 |
| 2.2 | -.722 | -.810 | 1.390 | 1.478 | .190+00 | .155+00 | .245+02 | .301+02 | .245+00 | .684+00 |
| 2.4 | -.815 | -.887 | 1.513 | 1.585 | .153+00 | .130+00 | .326+02 | .384+02 | .201+00 | .703+00 |
| 2.6 | -.912 | -.964 | 1.636 | 1.688 | .122+00 | .109+00 | .432+02 | .488+02 | .164+00 | .725+00 |
| 2.8 | -1.013 | -1.041 | 1.759 | 1.787 | .970-01 | .910-01 | .574+02 | .612+02 | .133+00 | .754+00 |
| 3.0 | -1.122 | -1.116 | 1.884 | 1.878 | .756-01 | .765-01 | .765+02 | .756+02 | .108+00 | .791+00 |
| 3.4 | -1.382 | -1.267 | 2.133 | 2.018 | .415-01 | .541-01 | .136+03 | .104+03 | .682-01 | .916+00 |
| 3.8 | -1.783 | -1.454 | 2.346 | 2.017 | .165-01 | .351-01 | .222+03 | .104+03 | .388-01 | .113+01 |
| 4.2 | -2.412 | -1.752 | 2.448 | 1.788 | .387-02 | .177-01 | .280+03 | .614+02 | .181-01 | .136+01 |
| 4.6 | -3.172 | -2.128 | 2.472 | 1.428 | .673-03 | .745-02 | .297+03 | .268+02 | .748-02 | .148+01 |
| 5.0 | -3.966 | -2.524 | 2.476 | 1.034 | .108-03 | .299-02 | .299+03 | .108+02 | .300-02 | .153+01 |

#1250

EXACT ZIMM EIGENVALUES N=300 H*= .15

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .504-03 | .297+01 | .336+00 | .425+04 | 2.143 | .467 | .451+07 | 1.1454 | .249 | 2.377 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .331 | -2.741 | -5.541 | -2.469 | .214+01 | .182-02 | .288-05 | .340-02 | .214+01 | .847-03 |
| -2.0 | .331 | -1.941 | -3.941 | -1.669 | .214+01 | .115-01 | .115-03 | .214-01 | .214+01 | .535-02 |
| -1.8 | .331 | -1.741 | -3.541 | -1.469 | .214+01 | .181-01 | .288-03 | .340-01 | .214+01 | .847-02 |
| -1.4 | .331 | -1.342 | -2.742 | -1.069 | .214+01 | .455-01 | .181-02 | .852-01 | .214+01 | .213-01 |
| -1.0 | .329 | -.945 | -1.945 | -.671 | .213+01 | .114+00 | .114-01 | .213+00 | .214+01 | .532-01 |
| -.8 | .326 | -.751 | -1.551 | -.474 | .212+01 | .178+00 | .281-01 | .336+00 | .212+01 | .837-01 |
| -.6 | .318 | -.564 | -1.164 | -.282 | .208+01 | .273+00 | [illegible] | .523+00 | .210+01 | .130+00 |
| -.4 | .301 | -.397 | -.797 | -.099 | .200+01 | .401+00 | .160+00 | .796+00 | .204+01 | .198+00 |
| -.2 | .266 | -.267 | -.467 | .066 | .184+01 | .541+00 | .341+00 | .116+01 | .192+01 | .285+00 |
| .0 | .207 | -.196 | -.196 | .207 | .161+01 | .636+00 | .636+00 | .161+01 | .173+01 | .376+00 |
| .2 | .131 | -.188 | .012 | .331 | .135+01 | .649+00 | .103+01 | .215+01 | .150+01 | .447+00 |
| .4 | .053 | -.217 | .183 | .453 | .113+01 | .607+00 | .153+01 | .284+01 | .128+01 | .493+00 |
| .6 | -.024 | -.261 | .339 | .576 | .945+00 | .548+00 | .218+01 | .376+01 | .109+01 | .526+00 |
| .8 | -.103 | -.314 | .486 | .697 | .789+00 | .486+00 | .306+01 | .498+01 | .927+00 | .552+00 |
| 1.0 | -.183 | -.372 | .628 | .817 | .657+00 | .424+00 | .424+01 | .657+01 | .782+00 | .573+00 |
| 1.2 | -.263 | [illegible] | .764 | .937 | .545+00 | .367+00 | .581+01 | .864+01 | .657+00 | .592+00 |
| 1.4 | -.346 | -.502 | .898 | 1.054 | .451+00 | .315+00 | .790+01 | .113+02 | .550+00 | .609+00 |
| 1.6 | -.429 | -.571 | 1.029 | 1.171 | .372+00 | .268+00 | .107+02 | .148+02 | .459+00 | .625+00 |
| 1.8 | -.515 | -.643 | 1.157 | 1.285 | .306+00 | .228+00 | .144+02 | .193+02 | .381+00 | .641+00 |
| 2.0 | -.602 | -.715 | 1.285 | 1.398 | .250+00 | .193+00 | .193+02 | .250+02 | .316+00 | .657+00 |
| 2.2 | -.692 | -.789 | 1.411 | 1.508 | .203+00 | .163+00 | .258+02 | .322+02 | .260+00 | .674+00 |
| 2.4 | -.784 | -.863 | 1.537 | 1.616 | .164+00 | .137+00 | .344+02 | .413+02 | .214+00 | .695+00 |
| 2.6 | -.880 | -.937 | 1.663 | 1.720 | .132+00 | .116+00 | .460+02 | .524+02 | .175+00 | .720+00 |
| 2.8 | -.982 | -1.011 | 1.789 | 1.818 | .104+00 | .976-01 | .616+02 | .658+02 | .143+00 | .752+00 |
| 3.0 | -1.092 | -1.083 | 1.917 | 1.908 | .809-01 | .826-01 | .826+02 | .809+02 | .116+00 | .796+00 |
| 3.4 | -1.366 | -1.230 | 2.170 | 2.034 | .431-01 | .589-01 | .148+03 | .108+03 | .729-01 | .939+00 |
| 3.8 | -1.803 | -1.430 | 2.370 | 1.997 | .158-01 | .372-01 | .234+03 | .994+02 | .404-01 | .117+01 |
| 4.2 | -2.463 | -1.745 | 2.455 | 1.737 | .344-02 | .180-01 | .285+03 | .545+02 | .183-01 | .138+01 |
| 4.6 | -3.234 | -2.127 | 2.473 | 1.366 | .584-03 | .747-02 | .297+03 | .232+02 | .749-02 | .149+01 |
| 5.0 | -4.029 | -2.523 | 2.477 | .971 | .936-04 | .300-02 | .300+03 | .936+01 | .300-02 | .154+01 |

EXACT ZIMM EIGENVALUES N=300 H*= .20

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JFR | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .633-03 | .263+01 | .380+00 | .352+04 | 2.229 | .449 | .287+07 | 1.1516 | .232 | 2.622 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG FTA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .348 | -2.739 | -5.539 | -2.452 | .223+01 | .183-02 | .289-05 | .353-02 | .223+01 | .819-03 |
| -2.0 | .348 | -1.939 | -3.939 | -1.652 | .223+01 | .115-01 | .115-03 | .223-01 | .223+01 | .517-02 |
| -1.8 | .348 | -1.739 | -3.539 | -1.452 | .223+01 | .18[illegible]-01 | .289-03 | .353-01 | .223+01 | .819-02 |
| -1.4 | .348 | -1.339 | -2.739 | -1.052 | .223+01 | .458-01 | .182-02 | .887-01 | .223+01 | .206-01 |
| -1.0 | .346 | -.943 | -1.943 | -.654 | .222+01 | .114+00 | .114-01 | .222+00 | .222+01 | .514-01 |
| -.8 | .343 | -.748 | -1.548 | -.457 | .220+01 | .179+00 | .283-01 | .349+00 | .221+01 | .809-01 |
| -.6 | .336 | -.562 | -1.162 | -.264 | .217+01 | .274+00 | .689-01 | .544+00 | .218+01 | .126+00 |
| -.4 | .319 | -.394 | -.794 | -.081 | .209+01 | .403+00 | .161+00 | .830+00 | .212+01 | .191+00 |
| -.2 | .285 | -.264 | -.464 | .085 | .193+01 | .544+00 | .343+00 | .122+01 | .200+01 | .275+00 |
| .0 | .229 | -.193 | -.193 | .229 | .169+01 | .642+00 | .642+00 | .169+01 | .181+01 | .362+00 |
| .2 | .157 | -.182 | .018 | .357 | .144+01 | .657+00 | .104+01 | .228+01 | .158+01 | .429+00 |
| .4 | .083 | -.209 | .191 | .483 | .121+01 | .618+00 | .155+01 | .304+01 | .136+01 | .472+00 |
| .6 | .009 | -.251 | .349 | .609 | .102+01 | .561+00 | .223+01 | .407+01 | .117+01 | .502+00 |
| .8 | -.065 | -.301 | .499 | .735 | .861+00 | .500+00 | .316+01 | .543+01 | .996+00 | .526+00 |
| 1.0 | -.140 | -.356 | .644 | .860 | .724+00 | .440+00 | .440+01 | .724+01 | .847+00 | .546+00 |
| 1.2 | -.217 | -.416 | .784 | .983 | .607+00 | .384+00 | .608+01 | .962+01 | .718+00 | .564+00 |
| 1.4 | -.295 | -.478 | .922 | 1.105 | .507+00 | .332+00 | .835+01 | .127+02 | .607+00 | .580+00 |
| 1.6 | -.374 | -.543 | 1.057 | 1.226 | .423+00 | .286+00 | .114+02 | .168+02 | .511+00 | .596+00 |
| 1.8 | -.455 | -.609 | 1.191 | 1.345 | .351+00 | .246+00 | .155+02 | .221+02 | .428+00 | .612+00 |
| 2.0 | -.539 | -.676 | 1.324 | 1.461 | .289+00 | .211+00 | .211+02 | .289+02 | .358+00 | .630+00 |
| 2.2 | -.625 | -.743 | 1.457 | 1.575 | .237+00 | .181+00 | .286+02 | .376+02 | .298+00 | .651+00 |
| 2.4 | -.715 | -.810 | 1.590 | 1.685 | .193+00 | .155+00 | .389+02 | .484+02 | .247+00 | .676+00 |
| 2.6 | -.810 | -.877 | 1.723 | 1.790 | .155+00 | .133+00 | .529+02 | .617+02 | .204+00 | .709+00 |
| 2.8 | -.913 | -.942 | 1.858 | 1.887 | .122+00 | .114+00 | .722+02 | .770+02 | .167+00 | .753+00 |
| 3.0 | -1.030 | -1.006 | 1.994 | 1.970 | .934-01 | .985-01 | .985+02 | .934+02 | .136+00 | .812+00 |
| 3.4 | -1.344 | -1.151 | 2.249 | 2.056 | .452-01 | .706-01 | .177+03 | .114+03 | .838-01 | .100+01 |
| 3.8 | -1.868 | -1.387 | 2.413 | 1.932 | .135-01 | .410-01 | .259+03 | .855+02 | .432-01 | .125+01 |
| 4.2 | -2.586 | -1.735 | 2.465 | 1.614 | .259-02 | .184-01 | .292+03 | .411+02 | .186-01 | .143+01 |
| 4.6 | -3.371 | -2.125 | 2.475 | 1.229 | .426-03 | .750-02 | .299+03 | .169+02 | .751-02 | .151+01 |
| 5.0 | -4.168 | -2.523 | 2.477 | .832 | .679-04 | .300-02 | .300+03 | .679+01 | .300-02 | .155+01 |

EXACT ZIMM EIGENVALUES N=300 H*= .25

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JFR | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .764-03 | .229+01 | .437+00 | .302+04 | 2.308 | .433 | .198+07 | 1.1564 | .217 | 2.814 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .363 | -2.737 | -5.537 | -2.437 | .231+01 | .183-02 | .290-05 | .366-02 | .231+01 | .794-03 |
| -2.0 | .363 | -1.937 | -3.937 | -1.637 | .231+01 | .116-01 | .116-03 | .231-01 | .231+01 | .501-02 |
| -1.8 | .363 | -1.737 | -3.537 | -1.437 | .231+01 | .183-01 | .290-03 | .366-01 | .231+01 | .794-02 |
| -1.4 | .363 | -1.337 | -2.737 | -1.037 | .231+01 | .460-01 | .183-02 | .918-01 | .231+01 | .199-01 |
| -1.0 | .361 | -.941 | -1.941 | -.639 | .230+01 | .115+00 | .115-01 | .230+00 | .230+01 | .499-01 |
| -.8 | .358 | -.746 | -1.546 | -.442 | .228+01 | .179+00 | .284-01 | .362+00 | .229+01 | .784-01 |
| -.6 | .351 | -.560 | -1.160 | -.249 | .225+01 | .275+00 | .692-01 | .564+00 | .226+01 | .122+00 |
| -.4 | .335 | -.392 | -.792 | -.065 | .217+01 | .405+00 | .161+00 | .862+00 | .220+01 | .185+00 |
| -.2 | .303 | -.262 | -.462 | .103 | .201+01 | .547+00 | .345+00 | .127+01 | .208+01 | .266+00 |
| .0 | .249 | -.190 | -.190 | .249 | .177+01 | .646+00 | .646+00 | .177+01 | .189+01 | .350+00 |
| .2 | .180 | -.178 | .022 | .380 | .151+01 | .664+00 | .105+01 | .240+01 | .165+01 | .413+00 |
| .4 | .109 | -.203 | .197 | .509 | .129+01 | .626+00 | .157+01 | .323+01 | .143+01 | .453+00 |
| .6 | .039 | -.243 | .357 | .639 | .109+01 | .571+00 | .227+01 | .435+01 | .123+01 | .481+00 |
| .8 | -.032 | -.291 | .509 | .768 | .929+00 | .512+00 | .323+01 | .586+01 | .106+01 | .503+00 |
| 1.0 | -.103 | -.344 | .656 | .897 | .788+00 | .453+00 | .453+01 | .788+01 | .909+00 | .522+00 |
| 1.2 | -.176 | -.400 | .800 | 1.024 | .667+00 | .398+00 | .631+01 | .106+02 | .777+00 | .538+00 |
| 1.4 | -.249 | -.459 | .941 | 1.151 | .563+00 | .347+00 | .873+01 | .142+02 | .662+00 | .553+00 |
| 1.6 | -.324 | -.519 | 1.081 | 1.276 | .474+00 | .302+00 | .120+02 | .189+02 | .562+00 | .568+00 |
| 1.8 | -.401 | -.580 | 1.220 | 1.399 | .397+00 | .263+00 | .166+02 | .250+02 | .476+00 | .585+00 |
| 2.0 | -.481 | -.641 | 1.359 | 1.519 | .331+00 | .228+00 | .228+02 | .331+02 | .402+00 | .604+00 |
| 2.2 | -.563 | -.702 | 1.498 | 1.637 | .273+00 | .199+00 | .315+02 | .433+02 | .338+00 | .629+00 |
| 2.4 | -.651 | -.761 | 1.639 | 1.749 | .223+00 | .173+00 | .435+02 | .561+02 | .283+00 | .660+00 |
| 2.6 | -.746 | -.819 | 1.781 | 1.854 | .180+00 | .152+00 | .604+02 | .715+02 | .235+00 | .702+00 |
| 2.8 | -.852 | -.875 | 1.925 | 1.948 | .141+00 | .133+00 | .841+02 | .887+02 | .194+00 | .759+00 |
| 3.0 | -.978 | -.933 | 2.067 | 2.022 | .105+00 | .117+00 | .117+03 | .105+03 | .157+00 | .838+00 |
| 3.4 | -1.348 | -1.086 | 2.314 | 2.052 | .449-01 | .821-01 | .206+03 | .113+03 | .935-01 | .107+01 |
| 3.8 | -1.952 | -1.361 | 2.439 | 1.848 | .112-01 | .436-01 | .275+03 | .705+02 | .450-01 | .132+01 |
| 4.2 | -2.704 | -1.729 | 2.471 | 1.496 | .198-02 | .186-01 | .295+03 | .313+02 | .187-01 | .147+01 |
| 4.6 | -3.496 | -2.124 | 2.476 | 1.104 | .319-03 | .752-02 | .299+03 | .127+02 | .752-02 | .153+01 |
| 5.0 | -4.295 | -2.523 | 2.477 | .705 | .507-04 | .300-02 | .300+03 | .507+01 | .300-02 | .155+01 |

EXACT ZIMM EIGENVALUES N=300 H*= .262

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .795-03 | .221+01 | .453+00 | .293+04 | 2.326 | .430 | .183+07 | 1.1573 | .214 | 2.856 |

REDUCED DYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .367 | -2.737 | -5.537 | -2.433 | .233+01 | .183-02 | .291-05 | .369-02 | .233+01 | .789-03 |
| -2.0 | .367 | -1.937 | -3.937 | -1.633 | .233+01 | .116-01 | .116-03 | .233-01 | .233+01 | .498-02 |
| -1.8 | .367 | -1.737 | -3.537 | -1.433 | .233+01 | .183-01 | .291-03 | .369-01 | .233+01 | .788-02 |
| -1.4 | .366 | -1.337 | -2.737 | -1.034 | .232+01 | .460-01 | .183-02 | .925-01 | .232+01 | .198-01 |
| -1.0 | .365 | -.940 | -1.940 | -.635 | .232+01 | .115+00 | .115-01 | .232+00 | .232+01 | .495-01 |
| -.8 | .362 | -.746 | -1.546 | -.438 | .230+01 | .179+00 | .284-01 | .365+00 | .231+01 | .779-01 |
| -.6 | .355 | -.560 | -1.160 | -.245 | .226+01 | .276+00 | .692-01 | .569+00 | .228+01 | .121+00 |
| -.4 | .339 | -.392 | -.792 | -.061 | .218+01 | .406+00 | .161+00 | .869+00 | .222+01 | .184+00 |
| -.2 | .307 | -.261 | -.461 | .107 | .203+01 | .548+00 | .346+00 | .128+01 | .210+01 | .264+00 |
| .0 | .253 | -.189 | -.189 | .253 | .179+01 | .647+00 | .647+00 | .179+01 | .190+01 | .347+00 |
| .2 | .185 | -.177 | .023 | .385 | .153+01 | .665+00 | .105+01 | .243+01 | .167+01 | .410+00 |
| .4 | .115 | -.202 | .198 | .515 | .130+01 | .628+00 | .158+01 | .327+01 | .145+01 | .449+00 |
| .6 | .045 | -.242 | .358 | .645 | .111+01 | .573+00 | .228+01 | .442+01 | .125+01 | .477+00 |
| .8 | -.024 | -.289 | .511 | .776 | .945+00 | .514+00 | .324+01 | .596+01 | .108+01 | .498+00 |
| 1.0 | -.095 | -.341 | .659 | .905 | .804+00 | .456+00 | .456+01 | .804+01 | .924+00 | .516+00 |
| 1.2 | -.166 | -.397 | .803 | 1.034 | .682+00 | .401+00 | .635+01 | .108+02 | .791+00 | .531+00 |
| 1.4 | -.239 | -.455 | .945 | 1.161 | .577+00 | .351+00 | .881+01 | .145+02 | .675+00 | .546+00 |
| 1.6 | -.313 | -.514 | 1.086 | 1.287 | .487+00 | .306+00 | .122+02 | .194+02 | .575+00 | .561+00 |
| 1.8 | -.389 | -.574 | 1.226 | 1.411 | .408+00 | .267+00 | .168+02 | .258+02 | .488+00 | .578+00 |
| 2.0 | -.467 | -.634 | 1.366 | 1.533 | .341+00 | .232+00 | .232+02 | .341+02 | .413+00 | .598+00 |
| 2.2 | -.549 | -.693 | 1.507 | 1.651 | .282+00 | .203+00 | .322+02 | .448+02 | .348+00 | .623+00 |
| 2.4 | -.636 | -.750 | 1.650 | 1.764 | .231+00 | .178+00 | .447+02 | .580+02 | .292+00 | .656+00 |
| 2.6 | -.731 | -.805 | 1.795 | 1.869 | .186+00 | .157+00 | .624+02 | .739+02 | .243+00 | .701+00 |
| 2.8 | -.839 | -.859 | 1.941 | 1.961 | .145+00 | .138+00 | .872+02 | .915+02 | .200+00 | .762+00 |
| 3.0 | -.968 | -.915 | 2.085 | 2.032 | .108+00 | .122+00 | .122+03 | .108+03 | .162+00 | .846+00 |
| 3.4 | -1.352 | -1.072 | 2.328 | 2.048 | .444-01 | .847-01 | .213+03 | .112+03 | .956-01 | .109+01 |
| 3.8 | -1.973 | -1.356 | 2.444 | 1.827 | .106-01 | .440-01 | .278+03 | .671+02 | .453-01 | .133+01 |
| 4.2 | -2.732 | -1.729 | 2.471 | 1.468 | .185-02 | .187-01 | .296+03 | .294+02 | .188-01 | .147+01 |
| 4.6 | -3.525 | -2.124 | 2.476 | 1.075 | .299-03 | .752-02 | .299+03 | .119+02 | .753-02 | .153+01 |
| 5.0 | -4.323 | -2.523 | 2.477 | .677 | .475-04 | .300-02 | .300+03 | .475+01 | .300-02 | .155+01 |

#1250

EXACT ZIMM EIGENVALUES N=300 H*= .30

| L1 | LN | 1/(LN) | SUM 1/(LP) | SUM L1/LP | RECIP ROCAL | SUM (1/LP)2 | SUM(L1 /LP)2 | JER | PHI -23 |
|---|---|---|---|---|---|---|---|---|---|
| .892-03 | .195+01 | .514+00 | .267+04 | 2.382 | .420 | .146+07 | 1.1596 | .204 | 2.983 |

REDUCED CYNAMIC VISCOSITY AND MODULUS

| LOG OMTI | LOG ETA1R | LOG ETA2R | LOG G1R | LOG G2R | ETA1R | ETA2R | G1R | G2R | MOD ETAR | ARCTAN ETA2/1 |
|---|---|---|---|---|---|---|---|---|---|---|
| -2.8 | .377 | -2.736 | -5.536 | -2.423 | .238+01 | .184-02 | .291-05 | .377-02 | .238+01 | .772-03 |
| -2.0 | .377 | -1.936 | -3.936 | -1.623 | .238+01 | .116-01 | .116-03 | .238-01 | .238+01 | .487-02 |
| -1.8 | .377 | -1.736 | -3.536 | -1.423 | .238+01 | .184-01 | .291-03 | .377-01 | .238+01 | .772-02 |
| -1.4 | .377 | -1.336 | -2.736 | -1.023 | .238+01 | .461-01 | .184-02 | .948-01 | .238+01 | .194-01 |
| -1.0 | .375 | -.939 | -1.939 | -.625 | .237+01 | .115+00 | .115-01 | .237+00 | .237+01 | .484-01 |
| -.8 | .372 | -.745 | -1.545 | -.428 | .236+01 | .180+00 | .285-01 | .373+00 | .236+01 | .762-01 |
| -.6 | .365 | -.559 | -1.159 | -.235 | .232+01 | .276+00 | .694-01 | .583+00 | .234+01 | .118+00 |
| -.4 | .350 | -.391 | -.791 | -.050 | .224+01 | .406+00 | .162+00 | .891+00 | .228+01 | .180+00 |
| -.2 | .318 | -.260 | -.460 | .118 | .208+01 | .549+00 | .347+00 | .131+01 | .215+01 | .258+00 |
| .0 | .266 | -.188 | -.188 | .266 | .185+01 | .649+00 | .649+00 | .185+01 | .196+01 | .338+00 |
| .2 | .200 | -.175 | .025 | .400 | .159+01 | .668+00 | .106+01 | .251+01 | .172+01 | .399+00 |
| .4 | .132 | -.199 | .201 | .532 | .136+01 | .632+00 | .159+01 | .341+01 | .150+01 | .436+00 |
| .6 | .065 | -.238 | .352 | .665 | .116+01 | .578+00 | .230+01 | .463+01 | .130+01 | .462+00 |
| .8 | -.002 | -.284 | .516 | .798 | .996+00 | .570+00 | .328+01 | .628+01 | .112+01 | .481+00 |
| 1.0 | -.069 | -.334 | .666 | .931 | .852+00 | .463+00 | .463+01 | .852+01 | .970+00 | .498+00 |
| 1.2 | -.138 | -.388 | .812 | 1.062 | .728+00 | .409+00 | .648+01 | .115+02 | .835+00 | .512+00 |
| 1.4 | -.207 | -.444 | .956 | 1.193 | .621+00 | .360+00 | .904+01 | .156+02 | .717+00 | .526+00 |
| 1.6 | -.278 | -.500 | 1.100 | 1.322 | .527+00 | .316+00 | .126+02 | .210+02 | .615+00 | .540+00 |
| 1.8 | -.350 | -.556 | 1.244 | 1.450 | .446+00 | .278+00 | .175+02 | .282+02 | .526+00 | .557+00 |
| 2.0 | -.426 | -.611 | 1.389 | 1.574 | .375+00 | .245+00 | .245+02 | .375+02 | .44[illegible]+00 | .579+00 |
| 2.2 | -.505 | -.663 | 1.537 | 1.695 | .313+00 | .217+00 | .344+02 | .455+02 | .381+00 | .607+00 |
| 2.4 | -.590 | -.714 | 1.686 | 1.810 | .257+00 | .193+00 | .486+02 | .645+02 | .322+00 | .645+00 |
| 2.6 | -.685 | -.761 | 1.839 | 1.915 | .206+00 | .173+00 | .690+02 | .821+02 | .269+00 | .699+00 |
| 2.8 | -.797 | -.808 | 1.992 | 2.003 | .159+00 | .156+00 | .981+02 | .101+03 | .223+00 | .773+00 |
| 3.0 | -.938 | -.861 | 2.139 | 2.062 | .115+00 | .138+00 | .138+03 | .115+03 | .180+00 | .874+00 |
| 3.4 | -1.376 | -1.034 | 2.366 | 2.024 | .421-01 | .925-01 | .232+03 | .106+03 | .102+00 | .114+01 |
| 3.8 | -2.045 | -1.345 | 2.455 | 1.755 | .902-02 | .451-01 | .285+03 | .569+02 | .460-01 | .137+01 |
| 4.2 | -2.818 | -1.727 | 2.473 | 1.382 | .152-02 | .188-01 | .297+03 | .241+02 | .188-01 | .149+01 |
| 4.6 | -3.613 | -2.123 | 2.477 | .987 | .244-03 | .753-02 | .300+03 | .970+01 | .753-02 | .154+01 |
| 5.0 | -4.412 | -2.523 | 2.477 | .568 | .387-04 | .300-02 | .300+03 | .387+01 | .300-02 | .156+01 |



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